Canadian Association of Professional Apiculturists

STATEMENT ON HONEY BEE WINTERING LOSSES AND DISEASES MANAGEMENT IN CANADA FOR 2025

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SUMMARY

The Canadian Association of Professional Apiculturists (CAPA) and Provincial Apiarists coordinated the annual honey bee wintering losses and diseases management report for 2024-2025. As in previous years, the survey consisted of harmonized questions based on the national beekeeping industry, with Provincial Apiarists collecting survey data across all provinces. Respondents collectively wintered 435, 059 honey bee colonies across Canada, representing 55% of all colonies operated in the country during 2024-2025. **The national winter loss, including non-viable bee colonies, was 39.3% with provincial losses ranging from 12.9% to 44.7%**. The national colony loss reported in 2025 is, again this year, higher than the average annual loss reported between 2007-2024 (27.7%). Furthermore, the total number of colonies operated by Canadian beekeepers decreased by 2.4% (19,985 colonies) during 2024-2025. Despite these recent losses, Statistics Canada reports that the total national colony count increased by 41% from 2007, through the hard work and expense of beekeepers replacing dead or weak colonies.

Each province ranked the top four suspected causes of colony losses as reported by respondents. The reported causes varied between provinces this year. In 2024-2025 impacts from *Varroa destructor* and associated viruses, weak colonies in the fall and poor queens seem to have been more important across the country. This was followed by weather/climate and starvation.

Beekeepers also responded to questions about the management of four serious parasites and pathogens to beekeeping: *Varroa destructor*, *Vairimorpha* (*Nosema*) spp., American foulbrood (*Paenibacillus larvae)* and European foulbrood *(Melissococcus plutonius)*. Beekeepers in most provinces reported that they monitored for varroa mites, however a proportion of beekeepers in some provinces neglected to do. The most reported varroa treatments were: amitraz, oxalic or formic acid treatments in early season; formic or oxalic acid in mid-season; and oxalic acid, formic acid or amitraz at the end of the season. Canadian beekeepers treated their colonies to manage the risk of nosemosis, as well as American foulbrood and European foulbrood. Across the country, registered antibiotics were the most commonly used treatments, with methods and timing of applications varying among provinces.

Provincial Apiarists, technology-transfer personnel and researchers have been working with beekeepers across Canada to encourage them to monitor for honey bee pests, especially varroa mites, brood diseases, and *Vairimorpha*, and to adopt recommended integrated pest management (IPM) and best management practices (BMP) to keep these pests under control. CAPA members continue to collaborate through working groups encompassing diverse stakeholders to educate, develop and improve management options for beekeepers to keep healthy bees, and manage winter losses in Canada.

Disclaimer and Credits: Survey data were supplied by Provincial Apiarists (listed in Appendix A). Data were then compiled, further analyzed and an initial draft of this report written by Julie Ferland, Geoff Wilson, Paige Marchant and Medhat Nasr, with subsequent review by the CAPA National Survey Committee.

INTRODUCTION

For over a decade, many countries, including Canada, have surveyed beekeepers and reported overwintering mortality rates of honey bee colonies and management practices used for varroa mites, nosema, American foulbrood and more recently, European foulbrood. The Canadian Association of Professional Apiculturists (CAPA) has worked with the Provincial Apiarists on surveying beekeepers for winter losses of honey bee colonies and possible causes of bee mortality in Canada since 2007. The objective of this national report is to consolidate provincial honey bee data across the country based on information collected through harmonized survey questions. The possible causes of winter loss, as reported by beekeepers, and information on pest surveillance and control are collated herein. The survey responses aid in identifying gaps in current management systems, developing strategies to mitigate colony losses, and provide guidance for improving bee health, biosecurity practices, and industry sustainability.

METHODOLOGY

In 2025, the Provincial Apiarists and the CAPA National Survey Committee members reviewed the questions used in the 2024 survey and made necessary revisions. Examples of these revisions include the addition of new treatments or strategies for beekeepers to manage pests and diseases as they are developed over the years, and adjustments to the questions regarding foulbrood and use of antibiotics. The result was an updated harmonized set of questions that was used in the 2025 survey (Appendix B). These questions took into account the large diversity of beekeeping industry profiles, management practices and seasonal activities within each province. Some provinces also included supplementary regional questions in their provincial questionnaire. The results of these regional questions are not included in this report but are discussed in the text. Further questions about results from a specific province may be accessed by contacting the Provincial Apiarist of the province in question (Appendix A).

Beekeepers that owned and operated a specified minimum number of colonies (Table 1) were included in the survey. This year, the minimum number of colonies required to be included in the national report was set to 20 for Newfoundland and Labrador, 25 for Prince Edward Island and 10 for British Columbia. The survey reported data from full-sized producing honey bee colonies that were wintered in Canada, but not nucleus colonies. Thus, the information gathered provides a valid assessment of honey bee losses and commercial management practices.

The common definitions of a honey bee colony and a commercially viable honey bee colony in spring were standardized as follows:

- Honey Bee Colony: A full-sized honey bee colony either in a single or double brood chamber, not including nucleus colonies (splits).
- Viable Honey Bee Colony in Spring: A honey bee colony that survived winter, with a minimum of 4 frames with 75% of the comb area covered with bees on both sides on May 1st (British Columbia), May 15th (New Brunswick, Nova Scotia, Ontario, Prince-Edward-Island and Quebec) or May 21st (Alberta, Manitoba, Saskatchewan and Newfoundland and Labrador).

The colony loss and management questionnaire was provided to producers using various methods of delivery including mail, email, online and a telephone survey; the method of delivery varied by jurisdiction (Table 1). In each province, data were collected, summarized and analyzed by the Provincial Apiarist. All reported provincial results were then analyzed and summarized at the national level. The national percent winter loss was calculated as follows:

$$Percentage\ Winter\ Loss = \left(\frac{Sum\ of\ the\ estimated\ total\ colony\ losses\ per\ province\ in\ spring\ 2025}{Sum\ of\ total\ colonies\ in\ operation\ in\ each\ province\ for\ 2024}\right) x\ 100$$

RESULTS

Response rates and global mortality

Throughout Canada, a total of 547 beekeepers responded to the 2025 survey. These respondents represented 31% of all the surveyed beekeepers. Respondents operated 55% of all registered colonies that were operated in all provinces in the 2024 season. The rate of participation and number of colonies continues to represent a substantial proportion of the commercial beekeeping industry in Canada.

The survey delivery methods, size of beekeeping operations, and response rate of beekeepers for each province are presented in **Table 1**. It is important to note that the total number of colonies operated in a province reported by this survey may vary slightly from Statistics Canada's official numbers. In some provinces, the data collection periods for the provincial database and the Statistics Canada report are at different times of year.

Survey results showed that the national level of wintering loss, including non-viable colonies, was 39.3% with individual provinces ranging from 12.9% to 44.7%. The overall winter loss for 2024-2025 was 4.7% greater than the 2023-2024 loss at 34.6%. The level of winter loss varied from province to province, and among beekeeping operations within each province. In general, all provinces reported higher mortality in 2024-2025 than the previous year, the exception being Prince Edward Island, Quebec and Ontario which reported lower mortalities compared to the previous year. New Brunswick and Saskatchewan reported the highest winter losses in 2025 (44.7% and 43.8%, respectively), with varroa mites and associated viruses listed by beekeepers as the main cause of colony mortality in Saskatchewan; no data were collected on this topic in New Brunswick. The lowest reported winter loss was, again this year, in Newfoundland and Labrador (12.9%), where varroa mites have not been reported.

For detailed information about the winter losses in each province, please contact the office of the Provincial Apiarist directly (**Appendix A**).

Table 1. Survey parameters and honey bee colony mortality (2024-2025) by province

Province	Total number of colonies operated in 2024	Estimated number of colonies lost based on the estimated provincial winter loss	Type of data collection	Number of beekeepers targeted by survey	Number of respondents (% of participation)	Minimum size of beekeeping operations targeted by survey (# of colonies)	Number of respondents' colonies that were wintered in fall 2024	Number of respondents' colonies that were alive and viable in spring 2025	Percentage of surveyed colonies as a proportion of the total number of colonies in the province	Provincial Winter Loss including Non-viable Colonies
Newfoundland and Labrador	837	108	Email, Phone, Online	21	12 (57%)	20	708	617	85%	12.9%
Prince Edward Island	4 500	1 031	Email, Phone	25	15 (60%)	25	3 985	3 072	89%	22.9%
Nova Scotia	30 873	5 658	Email, Online	48	34 (71%)	50	21 587	17 631	70%	18.3%
New Brunswick	13 778	6 164	Email	40	19 (48%)	50	7 924	4 379	58%	44.7%
Quebec	65 229	15 305	Online	110	68 (62%)	50	39 905	30 542	61%	23.5%
Ontario	83 977	31 357	Online, Phone	223	60 (27%)	50	20 019	12 544	24%	37.3%
Manitoba	114 000	49 162	Online, Phone	208	66 (32%)	50	49 772	28 308	44%	43.1%
Saskatchewan	95 000	41 619	Online	240	76 (32%)	100	37 926	21 311	40%	43.8%
Alberta	303 508	126 920	Online, Email, Phone	154	76 (49%)	100	245 464	142 817	81%	41.8%
British Columbia	84 555	36 003	Online	675	121 (18%)	10	7 769	4 461	9%	42.6%
Canada	796 257	313 327		1 744	547 (31%)		435 059	265 682	55%	39.3%[1]

[1] This number is the total loss calculated over all colonies in Canada.

Overwintering methods

Overall, 78% of the colonies owned by respondents were wintered outdoors in fall 2024, with remaining colonies (22%) wintered indoors (**Table 2**). The highest percentages of colonies wintered indoors were in Quebec (63%) and Nova Scotia (58%), followed by Manitoba (49%). Newfoundland and Labrador, Prince Edward Island and Ontario had no colonies wintered indoors.

Table 2. Overwintering method by province

Province	Outdoor		Indoor	
	Number of colonies	Percent (%)	Number of colonies	Percent (%)
NL	708	100	0	0
PEI	3 985	100	0	0
NS	9 146	42	12 441	58
NB	ND[a]	ND	ND	ND
QC	14 927	37	24 978	63
ON	20 019	100	0	0
MB	17 872	51	17 259	49
SK	31 211	82	6 715	18
AB	217 172	88	28 292	12
BC	7 629	98	140	2
Canada	322 669	78	89 825	22

[a] ND: no data.

Nationally, the mortality rate was slightly higher for colonies wintered outdoors (41%) than indoors (32%). The mortality rates for each province are presented in **Table 3.**

Table 3. Indoor and outdoor winter mortality by province

Province	Outdoor			Indoor		
	Total number of colonies in fall 2024	Total number of viable colonies in spring 2025	Percent losses of colonies (%)	Total number of colonies in fall 2024	Total number of viable colonies in spring 2025	Percent losses of colonies (%)
NL	708	617	13	0	0	NA
PEI	3 985	3 072	23	0	0	NA
NS	9 146	6 854	25	12 441	10 777	13
NB	ND[a]	ND	ND	ND	ND	ND
QC	14 927	10 742	28	24 978	19 800	21
ON	20 019	12 574	37	0	0	NA
MB	17 872	10 186	43	17 259	9 731	44
SK	31 211	18 491	41	6 715	2 820	58
AB	217 172	124 858	43	28 292	17 959	37
BC	7 629	4 461	43	140	114	19
Canada	322 669	191 855	41	89 825	61 201	32

[a] ND: no data.

Contributing factors as cited by beekeepers

Beekeepers were asked to rank possible contributing factors to colony mortality. These responses are summarized in **Table 4**. When the top four causes cited were compiled, considering their rank and frequency, *Varroa destructor* and associated viruses was the most potential cause for bee mortality. Weak colonies in the fall and poor queens were considered the second and third potential causes of bee mortality, respectively. The fourth potential cause was weather in 2025.

Varroa mites and associated viruses were reported as the top contributing factor to winter colony loss in five provinces. Varroa mites and their impact on honey bee health is a serious issue for Canadian beekeepers, and survey results indicate that many beekeepers are monitoring and applying multiple treatments per year. Unfortunately, some individual producers monitored and treated for varroa mites too late in the season when varroa and associated virus levels were already at damaging thresholds; this resulted in bees going into winter having already been compromised. Monitoring varroa mite levels is becoming increasingly important especially as environmental factors such as climate and weather can impact colony growth as well as the efficacy of miticides used by beekeepers. Moreover, the emergence of resistance to Apivar® (active ingredient, amitraz) may limit the efficacy of this product. With lower efficacy, the ability of mite populations to rebound back to damaging levels is increased. In addition, reinfestation of varroa mites from neighbouring beekeeping operations may also occur after a treatment has been applied. Therefore, monitoring varroa levels frequently, before and after treatment (verifying treatment efficacy), testing for amitraz resistance and selecting suitable alternative treatments, are all necessary elements of an effective management strategy for this economically important pest.

Weak colonies in the fall were also among the top four reported contributing factors to winter losses in eight provinces. There can be many causes for weak colonies such as lack of nutrition, environmental stressors (e.g. weather, intensive pollination management), late establishment of colonies, or weakening of colonies by pathogens and diseases, such as varroa, foulbrood or nosemosis.

Poor queens were also reported by eight provinces as an important contributing factor to winter losses this year. Poor queens can result in weakened colonies prior to winter, leading to an insufficient number of bees to survive. If a queen becomes infertile or dies during the winter, the colony will also perish as there is no opportunity for the beekeeper to replace the queen or for the colony to naturally re-queen itself. Poor and failing queens may be the result of many factors including inadequate rearing conditions, poor mating weather, reduced sperm viability, queen age, diseases or exposure to pesticides within the hive or from the environment (Amiri et al., 2017; Pettis et al., 2004; Pettis et al., 2016; Williams et al., 2015).

Weather and climate was cited among the top rated causes of 2025 winter losses by seven provinces across Canada, however this seemed to have less impact and importance than the previous year. In the prairie provinces (Manitoba, Saskatchewan and Alberta), dry weather during the summer of 2024 resulted in an early end to honey and pollen flows, possibly resulting in lower nutrition for the development of winter bees. In the East (East of Manitoba), the summer of 2024 was generally marked by heat waves and humidity with large variations between regions in terms of precipitation (some regions were very dry while others had abundant precipitation). The autumn of 2024 was also warmer and longer than usual in eastern Canada, promoting more brood rearing and increased in varroa populations prior to winter. During the winter, fluctuating temperatures across the country had the potential to negatively affect wintering colonies but winter 2024-2025 had more mild periods than normal. Unfortunately, poor conditions for foraging (cold, rain, wind and cloud) were present during a substantial part of the spring 2025 hindering colony build-up causing surviving colonies to dwindle. The unfavourable spring conditions impacted the health of surviving colonies causing an increase in the number of non-viable colonies in many provinces. Across many parts of the country, the length of the beekeeping season was longer than usual, leading to protracted brood production for colonies and the need to modify beekeeping practices, especially for mite control. Temperatures also affected the efficacy of some varroa treatments so weather may also have an impact on varroa control and indirectly on colony strength and survival.

Starvation was reported as a cause of winter mortality by beekeepers in five provinces. Starvation can result from the inability of bees in weak colonies to store enough food during the fall, the inability of bees to move to resources within the hive during winter, the rapid consumption of stored food because of early brood production or insufficient feed provided by the beekeeper in the fall or spring.

Few beekeepers reported that they did not know why their colonies perished, and this answer was not identified among the top four causes for losses among provinces. Inability to identify a possible cause for colony mortality may be associated with lack of applying best management practices including monitoring for pests, diseases and other general colony health parameters during the season, or a multitude of underlying problems that cannot be identified without the assistance from specialists.

Table 4. Top four ranked possible causes of honey bee colony mortality by province

Province	Ranked 1st the most	Ranked 2nd the most	Ranked 3rd the most	Ranked 4th the most
NL[a]	Starvation	Weak colonies in the fall	Weather/Climate	Other
PEI	Weak colonies in the fall	Poor queens	Weather/Climate	Starvation
NS	Weak colonies in the fall	Poor queens	Varroa and associated viruses	Weather/Climate
NB	ND[b]	ND	ND	ND
QC	Varroa and associated viruses	Poor queens	Weak colonies in the fall	Starvation
ON	Varroa and associated viruses	Weather/Climate	Weak colonies in the fall	Poor queens
MB	Varroa and associated viruses	Poor queens	Weak colonies in the fall	Starvation
SK	Varroa and associated viruses	Weather/Climate	Poor queens	Weak colonies in the fall
AB	Varroa and associated viruses	Poor queens	Weather/Climate	Starvation
BC	Weak colonies in the fall	Poor queens	Varroa and associated viruses	Weather/Climate

[a] Varroa mites have not been reported in Newfoundland and Labrador.
[a] ND: no data.

The top four reported causes of winter losses for operations exceeding 25% mortality are presented in **Table 5**. When compiling the frequency and relative ranking of beekeeper's responses, varroa and associated viruses had more impact on winter losses in these operations. This reason was followed by weather and climate, weak colonies in the fall, poor queens and finally starvation.

Table 5. Top four ranked possible causes of bee colony mortality by province, as cited by beekeepers who reported greater than 25% losses				
Province	**Ranked 1st the most**	**Ranked 2nd the most**	**Ranked 3rd the most**	**Ranked 4th the most**
NL[a]	Starvation	Weak colonies in the fall	Weather/Climate	Other
PEI	Weather/Climate	Weak colonies in the fall	Poor queens	Varroa and associated viruses
NS	Varroa and associated viruses	Weak colonies in the fall	Weather/Climate	Poor queens
NB	ND[b]	ND	ND	ND
QC	Varroa and associated viruses	Poor queens	Weather/Climate	Weak colonies in the fall
ON	Varroa and associated viruses	Weather/Climate	Weak colonies in the fall	Starvation
MB	Varroa and associated viruses	Weak colonies in the fall	Poor queens	Don't know
SK	Varroa and associated viruses	Weather/Climate	Poor queens	Weak colonies in the fall
AB	Varroa and associated viruses	Weather/Climate	Poor queens	Starvation
BC	Varroa and associated viruses	Poor queens	Weak colonies in the fall	Starvation

[a] Varroa mites have not been reported in Newfoundland and Labrador.

[b] ND: no data.

Integrated Pest Management

Integrated Pest Management (IPM) has become widely used to maintain healthy honey bees. To successfully manage bee health, beekeepers must identify and monitor pests and diseases to take timely action in accordance with approved treatment methods. This survey focused on asking beekeepers questions about their management of four serious threats that may impact bee health, survivorship and productivity (**Appendix B**).

Varroa monitoring

The varroa mite continues to be considered by beekeepers and apicultural specialists as one of the main causes of honey bee colony mortality.

During the 2024 beekeeping season, alcohol washes, sugar shakes or ether rolls using 300 bees per colony were the preferred methods of detection in all provinces except Quebec, where beekeepers favoured the use of sticky boards (**Table 6**). The frequency of use for the alcohol wash technique ranged from 43% in Québec to 88% in Manitoba, Saskatchewan and Alberta, while the frequency of use for the sticky board method ranged from 8% in Newfoundland and Labrador, Prince Edward Island and Saskatchewan to 78% in Quebec. Some beekeepers also used both methods to evaluate levels of mites.

Table 6. Varroa monitoring methods by province		
Province	**% of beekeepers using Mite fall/Sticky boards**	**% of beekeepers using Alcohol wash (or Sugar shake/Ether roll)**
NL[a]	8	58
PEI	8	87
NS	25	75
NB	ND[b]	ND
QC	78	43
ON	23	82
MB	25	88
SK	8	88
AB	39	88
BC	20	50

[a] Varroa mites have not been reported in Newfoundland and Labrador.
[b] ND: no data.

The timing of sampling is important. There are three main critical windows identified within the season where monitoring varroa mites is particularly important: the beginning, middle and end of the season. Additionally, sampling prior to treatment windows can inform beekeepers as to whether treatments are needed, while sampling after treatment determines whether taken actions to control mites were efficacious or not. The percentage of beekeepers that always sampled before treatment varied from 13% in Prince Edward Island to 63% in Alberta, while beekeepers that never sampled before treatment varied from 6% in Quebec to 40% in Prince Edward Island (**Table 7**). The percentage of beekeepers that always tested after treatment applications ranged from 20% in Prince Edward Island to 70% in Saskatchewan, while beekeepers that never tested post treatment varied from 10% in Alberta to 47% in Prince Edward Island.

Table 7. Percentage of beekeepers monitoring before and after varroa treatment by province						
Province	**Always before treatment**	**Sometimes before treatment**	**Never before treatment**	**Always after treatment**	**Sometimes after treatment**	**Never after treatment**
NL[a]	NA[b]	NA	NA	NA	NA	NA
PEI	13	47	40	20	33	47
NS	40	50	10	30	37	33
NB	ND[c]	ND	ND	ND	ND	ND
QC	60	34	6	46	40	14
ON	27	50	23	30	46	23
MB	51	29	20	45	34	22
SK	30	50	20	70	15	15
AB	63	29	8	64	26	10
BC	ND	ND	ND	ND	ND	ND

[a] Varroa mites have not been reported in Newfoundland and Labrador.
[b] NA: not applicable.
[c] ND: no data.

These results demonstrate that many Canadian beekeepers recognize the value of monitoring for varroa. Nevertheless, the desired goal is to have **all beekeepers regularly monitor** for varroa populations throughout the beekeeping season, particularly prior to treatment application windows, as well as after treatment to verify efficacy. Such sampling will ensure optimal timing of treatments and selection of the most effective treatment options for varroa control. While education and extension programs delivered to Canadian beekeepers have facilitated the adoption of recommended practices for managing varroa, ongoing innovation and improvement must continue.

Varroa control

In Canada, there are a variety of registered miticides available to beekeepers for mite control. Beekeepers are encouraged to use the most effective miticide that suits their region, season and operation. Beekeepers are also encouraged to rotate miticides to prevent the development of resistance to these products. In the current survey of bee winter losses, beekeepers were asked "what chemical treatment was used for varroa control during the 2024 season" with responses divided into the beginning, middle and end of the beekeeping season. Beekeeper's responses are summarized in **Tables 8, 9 and 10**. Rankings were compiled per treatment, but also per active ingredient. Because multiple commercially available treatments may use the same active ingredient, rankings may differ between treatment and active ingredient.

In the spring of 2024, the percentage of beekeepers who treated with chemical methods ranged from 63% to 98% in provinces where the mite is present. Ontario had the lowest percentage of beekeepers (respondents) who treated for varroa in the spring. For Canadian beekeepers who treat in the spring, the main miticide used for spring varroa control was Apivar® (active ingredient: amitraz). The second most common treatment was oxalic acid in various forms, followed by formic acid (**Table 8**). However, in Québec, formic or oxalic acid treatments were more widely used than amitraz in the Spring.

Table 8. Varroa control methods and compounds used at the **beginning of the season** by province			
Province	**% of Beekeepers who treated**	**Main treatment methods[a]**	**Main active ingredients**
NL[b]	NA[c]	NA	NA
PEI	80	Apivar (amitraz)	Amitraz
NS	94	Apivar (amitraz), Oxalic acid-sublimation, Oxalic acid-drip	Amitraz, Oxalic acid, Other
NB	ND[d]	ND	ND
QC	81	65% Formic acid - 40mL multiple applications, Oxalic acid – sublimation, Apivar (Amitraz)	Formic acid, Oxalic acid, Amitraz
ON	63	Apivar (amitraz), Oxalic acid-sublimation, Formic Pro (formic acid)	Oxalic acid, Amitraz, Formic acid
MB	98	Apivar (amitraz), Oxalic acid - sublimation, 65% Formic acid - 40mL multiple applications	Amitraz, Oxalic acid, Formic acid
SK	96	Apivar (amitraz), Oxalic acid - sublimation, Formic Pro (formic acid)	Amitraz, Oxalic acid, Formic acid
AB	96	Apivar (amitraz), Oxalic acid - sublimation, 65% Formic acid - 40mL multiple applications	Amitraz, Oxalic acid, Formic acid
BC	84	Apivar (Amitraz), Formic Pro (formic acid), Oxalic acid, Thymovar (Thymol)	Amitraz, Formic acid, Thymol (w or w/o other essential oils)

[a] Treatments and active ingredients listed from most to least used.
[b] Varroa mites have not been reported in Newfoundland and Labrador.
[c] NA: not applicable.
[d] ND: no data.

In the recent years, beekeepers have started to use a mid-season treatment for varroa control (**Table 9**). The number of products that can be used while honey supers are in place are limited to Formic Pro® and HopGuard® to safeguard honey quality. For other products (e.g., other formic or oxalic acid applications, and amitraz), honey supers must be absent from the hive or removed before and during the application of the product. Formic acid is the most frequently used active ingredient for mid-season treatments.

Table 9: Varroa treatment methods and compounds used at **mid-season (honeyflow)** by province			
Province	**% of Beekeepers who treated**	**Main treatment methods**[a]	**Main active ingredients**
NL[b]	NA[c]	NA	NA
PEI	27	MAQS (formic acid), Formic Pro (Formic Acid)	Formic acid
NS	15	Formic Pro (Formic acid), Apivar (Amitraz), Oxalic acid-drip	Formic acid, Amitraz, Oxalic acid
NB	ND[d]	ND	ND
QC	73	65% Formic acid – 40ml multiple applications, Formic Pro (Formic acid), Oxalic acid - sublimation	Formic acid, Oxalic acid, Other
ON	77	Formic Pro (formic acid), 65% formic acid – 40ml multiple applications, Oxalic acid – sublimation	Formic acid, Oxalic acid, Other
MB	27	Formic Pro (formic acid), Oxalic acid – sublimation, 65% formic acid – 40ml multiple applications	Formic acid, Oxalic acid, Thymol (w/or w/o other essential oils)
SK	20	Formic Pro (formic acid)	Formic acid
AB	51	Other, 65% formic acid – 40ml multiple applications, Oxalic acid - sublimation	Oxalic acid, Formic acid
BC	ND	ND	ND

[a] Treatments and active ingredients listed from most used to least used.
[b] Varroa mites have not been reported in Newfoundland and Labrador.
[c] NA: not applicable.
[d] ND: no data.

In fall of 2024, most Canadian beekeepers (66% to 100% depending on province) treated their colonies for varroa. The main miticides used at this time of year were oxalic acid, formic acid, and Apivar® (**Table 10**). It was noted that some beekeepers used Apivar® twice in the same year in 2024, once in spring and again in fall. In some provinces, a greater number of beekeepers have started to combine Apivar® with formic or oxalic acid for keeping control of mite populations. Thymovar® (a miticide with the active ingredient thymol) was also reported used in some provinces.

Apistan® (a synthetic miticide with the active ingredient tau-fluvalinate) or Checkmite+® (a synthetic miticide with the active ingredient coumaphos) have not been reported in the main treatment used during 2024 season. Beekeepers may be wary of these products because of previously reported resistance to these active ingredients in Canada. Bayvarol® (a synthetic miticide with the active ingredient flumethrin) was also rarely used; there have been concerns and reports from beekeepers about the limitations in the efficacy of this product, which have been confirmed by research projects in Canadian provinces (Currie et al., 2010; Morfin et al., 2022; Olmstead et al., 2019).

Table 10: Varroa control methods and compounds used at the **end of the season** by province			
Province	**% of Beekeepers who treated**	**Main treatment methods**[a]	**Main active ingredients**
NL[b]	NA[c]	NA	NA
PEI	93	Oxalic acid - sublimation,	Oxalic acid
NS	100	Oxalic acid - sublimation, Formic Pro (formic acid), Oxalic acid - drip	Oxalic acid, Formic acid, Other
NB	ND[d]	ND	ND
QC	100	Oxalic acid - sublimation, 65% Formic acid - 40mL multiple applications, Thymovar (thymol)	Oxalic acid, Formic acid, Thymol (w/or w/o other essential oils)
ON	66	Apivar (amitraz), Oxalic acid – drip, Oxalic acid - sublimation	Oxalic acid, Amitraz, Formic acid
MB	100	Oxalic acid - sublimation, Apivar (amitraz), Formic Pro (Formic acid)	Oxalic acid, Formic acid, Amitraz
SK	70	Oxalic acid - sublimation, Apivar (amitraz), Thymovar (Thymol)	Oxalic acid, Amitraz, Thymol (w/or w/o other essential oils)
AB	96	Oxalic acid - sublimation, 65% Formic acid - 40mL multiple applications, Formic Pro (Formic acid)	Oxalic acid, Formic acid
BC	92	Apivar (Amitraz), Oxalic acid - sublimation, Formic Pro (Formic acid)	Amitraz, Oxalic acid, Formic acid

[a] Treatments and active ingredients listed from most used to least used.
[b] Varroa mites have not been reported in Newfoundland and Labrador.
[c] NA: not applicable.
[d] ND: no data.

Figure 1 summarizes miticide applications by season. Although almost every beekeeper treats in the fall, and many do so in the spring, treatments during the mid-season honey flow are scarce. In addition, nectar flows may also occur late in the season in some provinces (ON, QC) necessitating mite treatments being applied while honey is still being produced. Treatments applied while honey is being produced must be labelled for this purpose; otherwise, they may only be applied outside of the flow or to non-honey-producing colonies, such as nuclei. Some beekeepers receiving revenue from pollination services may also not produce surplus honey.

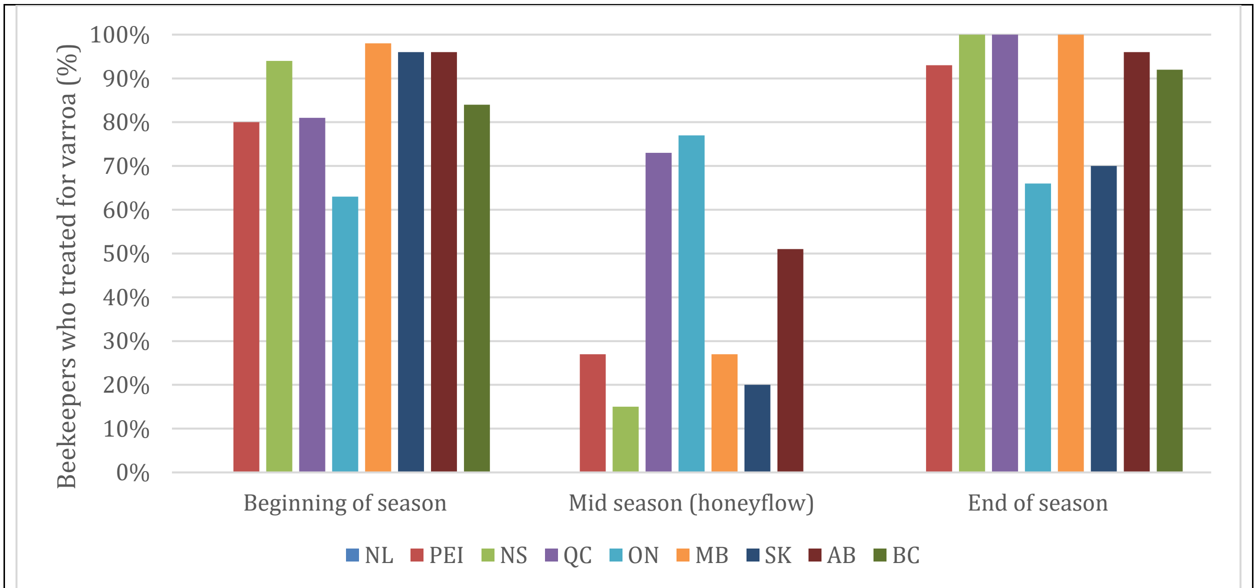

Figure 1. Percentages of beekeepers treating for varroa throughout the season

Once again, these surveys show that Apivar® is one of the most used miticides for treating varroa in Canada, mainly in spring, but there is an increasing use of organic acids in many provinces. Findings of decreased efficacy of Apivar® have been documented in some provinces. It is becoming increasingly important that beekeepers become aware of the principles associated with resistance development and the importance of monitoring the efficacy of all treatments. This will help to mitigate abrupt and widespread failures of treatments before mites cause irreparable damage to bees. Beekeepers are also encouraged to incorporate resistance management practices such as using appropriate thresholds for treatment, following label instructions, never leaving treatments in the hive beyond the appropriate treatment period or reusing chemical strips, and alternating miticides with different modes of action in their varroa treatment programs. Having a wide suite of legally registered treatments with different modes of action and methods of application is critical for maintaining a successful IPM strategy in Canada.

Nosemosis management practices

Vairimorpha (*Nosema*) is a fungal parasite that infects honey bees. *Vairimorpha* (*Nosema*) *ceranae* has gradually replaced *Vairimorpha* (*Nosema*) *apis* to become the most frequently found species in Canada (Copley et al., 2012; Emsen et al., 2016). The role of *V. ceranae* affecting honey bee colony survival during winter may vary by climatic region and bee populations in Canada. Several studies from central Canada have demonstrated that *V. ceranae* did not impact winter mortality, however the parasite was found to potentially impact the development of honey bee colonies in early spring (Emsen *et al*., 2016; Emsen *et al*., 2020; Guzman *et al*., 2010). Recently, a study from the Canadian Prairies (Punko 2021; Punko *et al*., 2021) has found that *Vairimorpha* can increase colony mortality. The impact of *Vairimorpha* was not cited by Canadian beekeepers in the top four possible cause of colony mortality during the 2024-2025 winter loss survey.

In the survey, beekeepers reported the use of fumagillin for the treatment of nosemosis in spring and/or in fall of 2024 (**Table 11**). The percentage of beekeepers that reported using this antibiotic varied widely from province to province. Beekeepers were also asked to report all alternative treatments that they used during the spring or the fall to control nosemosis. Fumagilin-B® is the only product registered by Health Canada for *Vairimorpha* (*Nosema*) treatment. Any other products mentioned by beekeepers are not currently registered for the treatment of this disease, though some are marketed and used as general promoters of honey bee health. It is also worth noting that there are some regions of Canada where Fumagilin-B® is not used by most beekeepers. This may be due varying seasonal patterns of *Vairimorpha* (*Nosema*) abundance among regions and the need to better refine predictors for nosema-related mortality (Punko 2021; Punko et al. 2021). Overall, nosemosis is still an issue impacting bee health and further research is required to understand its role in colony population build up, honey production and colony loss throughout Canada.

Table 11. Antibiotic (fumagillin) and alternative treatments usage (% of beekeepers) for nosemosis by province

Province	Beginning of season			End of season		
	Fumagillin	Other product	Main alternative products	Fumagillin	Other product	Main alternative products
NL	0	0	NA[a]	8	0	NA
PEI	0	0	NA	7	0	NA
NS	25	0	NA	32	0	NA
NB	ND[b]	ND	ND	ND	ND	ND
QC	4	29	Dietary supplement, Apple cider vinegar	0	27	Dietary supplements, Apple cider vinegar
ON	7	2	ND	5	2	ND
MB	24	3	Hive Alive. Bee Tea	24	2	Hive Alive
SK	35	25	ND	35	40	ND
AB	39	3	Probiotics, Bee Optimal	49	3	Hive Alive, Bee Optimal
BC	9	0	NA	12	0	NA

[a] NA: not applicable.
[b] ND: no data available

American and European foulbrood management practices

American foulbrood (AFB) is an endemic bacterial disease of brood in Canada caused by *Paenibacillus larvae*. It is also of great concern to beekeepers as active infections may result in large-scale loss of bees and equipment and can spread within regions if proper steps are not taken to eliminate infective colonies and equipment. In recent years, some beekeepers have reported an increasing impact of and difficulty controlling European foulbrood (EFB) in their operation, a bacterial brood disease caused by *Melissococcus plutonius*. Oxytetracycline, tylosin, and lincomycin are all antibiotics registered for treating AFB in Canada, with the latter two used for treating strains of the bacterium resistant to oxytetracycline. Oxytetracycline is the only registered treatment against EFB. The pattern of use for these antibiotics, as reported by beekeepers, is presented in **Table 12 and 13**. Oxytetracycline was the most frequently used antibiotic by beekeepers in the spring and in the fall, the spring use of oxytetracycline is more frequent than the fall use in all provinces except in British Colombia.

Table 12. Antibiotic treatments for American foulbrood (oxytetracycline, tylosin and lincomycin) at the beginning of the season by province				
Province	**Use of foulbrood treatments (% of respondents) at the beginning of season**			
	Oxytetracycline*	**Tylosin***	**Lincomycin***	**No Treatment**
NL	0	0	0	100
PEI	20	0	0	80
NS	35	0	0	65
NB	ND[a]	ND	ND	ND
QC	6	0	0	94
ON	57	2	0	30
MB	37	0	2	62
SK	33	1	0	66
AB	33	3	0	55
BC	2	2	0	96

*These categories are not mutually exclusive; therefore the total may be greater than 100.
[a] ND: no data.

Table 13. Antibiotic treatments for American foulbrood (oxytetracycline, tylosin and lincomycin) at the end of the season by province				
Province	**Use of foulbrood treatments (% of respondents) at the end of season**			
	Oxytetracycline*	**Tylosin***	**Lincomycin***	**No Treatment**
NL	0	0	0	100
PEI	13	0	0	87
NS	9	0	0	91
NB	ND[a]	ND	ND	ND
QC	2	0	0	98
ON	55	2	0	30
MB	27	3	2	68
SK	25	4	0	71
AB	26	1	0	70
BC	3	2	0	95

*These categories are not mutually exclusive; therefore, the total may be greater than 100.
[a] ND: no data.

Provincial recommendations on antibiotic use (e.g., prophylactic vs metaphylactic vs therapeutic) vary across the country. Among beekeepers using antibiotics, percentage of them using it for prevention, as therapy, or for both reasons are presented by province in **Table 14**. Among beekeepers using antibiotics therapeutically, EFB seems to be the more frequently observed than AFB (**Table 15**). In some cases, beekeepers using antibiotics for treating a brood disease are not sure of which disease is present.

Table 14. Antibiotic usage (preventive vs curative) for the management of foulbrood diseases during the 2024 season by province			
Province	**Use of antibiotics for foulbrood (% of respondents)**		
	To prevent disease (prevention)	**To treat observed disease (therapeutic)**	**To treat and prevent disease**
NL	0	0	0
PEI	25	50	25
NS	50	36	14
NB	ND[a]	ND	ND
QC	50	50	0
ON	100	0	0
MB	69	12	19
SK	90	0	10
AB	ND	ND	ND
BC	0	100	0

[a] ND: no data.

Table 15. Curative uses of antibiotics according to targeted diseases during the 2024 season by province			
Province	**Curative use of antibiotics for foulbrood (% of respondents)**		
	AFB	**EFB**	**Unsure**
NL	0	0	0
PEI	0	75	0
NS	0	86	14
NB	ND[a]	ND	ND
QC	0	100	0
ON	0	0	0
MB	13	50	38
SK	4	15	0
AB	ND	ND	ND
BC	95	5	0

[a] ND: no data.

Honey Bee Winter Loss and Population in Canada Since 2007

Reported winter loss has been variable from year to year in Canada since the start of these annual surveys in 2007. In 2025, the reported winter mortality averaged 39.3%. This is higher than the long-term suggested baseline for winter losses of 15%, suggesting that acceptable levels of loss have never been obtained during this period. As can be seen in **Figure 2,** from 2007 to 2025, national winter losses ranged from 15.3% to 45.5%, averaging 27.7%. In spite of these losses, between 2007 and 2024, Statistics Canada reports show that total number of colonies in Canada increased by 41%.

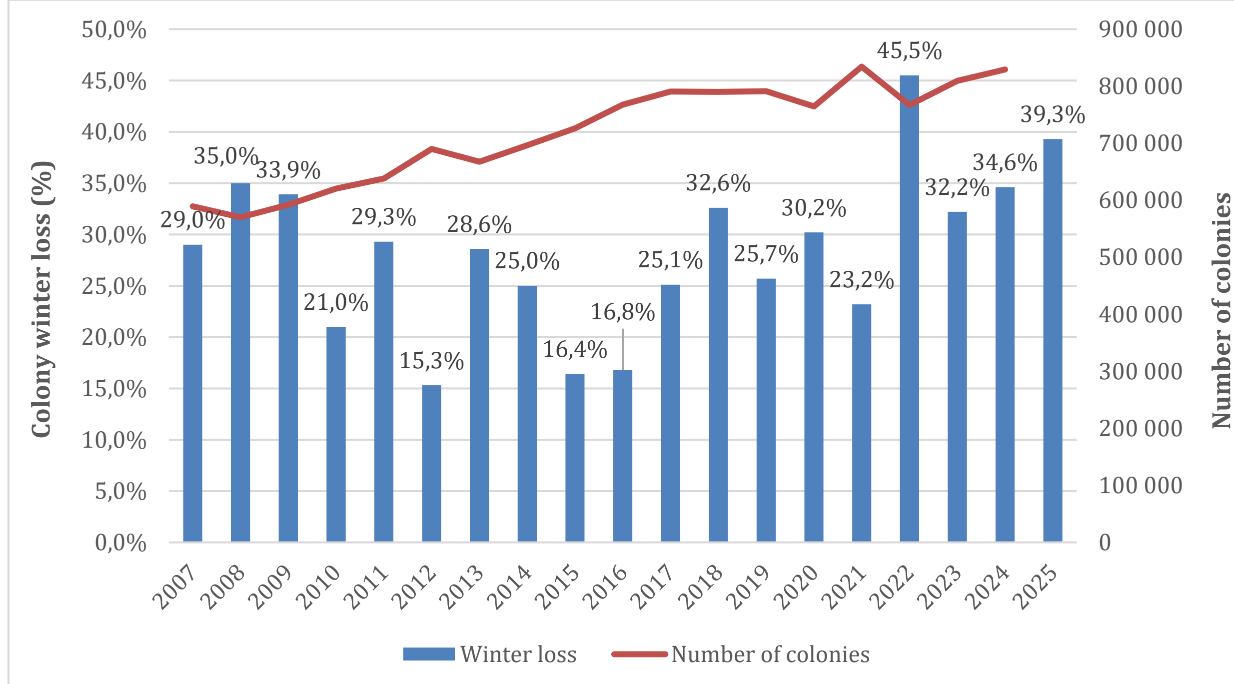

Figure 2. Summary of bee colony numbers (based on data as reported by Stats Canada) and bee losses in Canada from 2007-2025. *Note that the number of colonies as reported by Stats Canada is not available for the current year.*

Beekeepers must be vigilant and practice IPM and BMP for serious pests endemic to the honey bee population in Canada (e.g. varroa mites). A changing climate must be considered due to impacts on bee growth, varroa population development, treatment type and frequency of application. Beekeepers must also consider nutrition, and pesticide exposure within hives and from the environment as well as the added challenge of the economics of beekeeping which include variable honey prices and increasing costs of production. Individual beekeepers experiencing high winter losses face considerable expenses replacing dead colonies. These increased expenses greatly affect profitability and productivity and can put some beekeeping operations at risk of insolvency. Moreover, this survey and report do not take into account mid-season losses of honey bee colonies or queens that beekeepers may be experiencing throughout the beekeeping season. Nevertheless, the Canadian beekeeping industry has been resilient and able to grow, as proven by the overall increase in the number of bee colonies since 2007 (**Figure 2**), despite the difficulties faced every winter. While provincial estimates demonstrate regional trends in winter loss, results vary within provinces and beekeeping operations. While there are operations that have been highly successful, there is a real risk of losing large proportions of colonies in Canada, and continued vigilance is required to maintain bee health, profitable beekeeping operations, and enough stock to meet the demand for pollination services.

Although responses to this annual survey provide evidence that many beekeepers are using recommended practices for monitoring and managing honey bee pests and diseases, there are always opportunities for improvements. As such, the detailed management data from beekeepers summarised in this report has been used by some apiary and extension programs to focus on education, training, and communication efforts to beekeepers on improvement of management for honey bee pests.

It appears that stress caused by parasites in combination with other stressors warrant further study to provide alternative management practices for maintaining honey bee health. At this time, beekeepers have a limited number of products to control varroa and other diseases, and all of these options have their limitations. New options are important to mitigate the risk of developing resistance. When resistance develops to primary treatments, beekeepers could experience even greater and likely extreme difficulties keeping their bees alive. Ultimately, beekeepers will need more effective and additional options (miticides, antibiotics, and non-chemical management options) in their “toolbox” if they are to continue effective IPM and BMP to maintain healthy bees.

Further Work

CAPA members continue to work closely with industry stakeholders and provincial working groups to address bee health and industry economics. Provincial Apiarists and other CAPA members have also been involved in conducting surveillance programs at the provincial level and across the country to monitor the status of bee health including emerging pests. CAPA members, the Provincial Apiarists, and Canadian Bee Technology Transfer Programs are involved in conducting outreach and extension programs to promote IPM, BMP, and biosecurity practices to beekeepers. Researchers within CAPA are active in evaluating alternative control options for varroa mites and *Vairimorpha* (*Nosema*) and developing genetic stocks more tolerant to pests which will enhance IPM practices and address honey bee health sustainability.

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APPENDIX B: 2025 WINTER LOSS AND DISEASE MANAGEMENT SURVEY CORE QUESTIONS

The followings are the core questions that will be used in 2025 by each provincial apiarist for reporting the colony winter losses at the national level. As it has been since 2007, the objective is to estimate the winter kills with a simple and standardized method while taking into account the large diversity of situations around the country. This is a survey so these questions are to be answered by the beekeepers.

1. How many full sized colonies[1] were put into winter in fall 2024?

Outdoor wintering	Indoor wintering	Total

2. How many full sized colonies[1] survived the 2024/2025 winter and were considered viable[2] on May 1st (British Columbia), May 15th (Ontario, Quebec and Maritimes) or May 21st (Alberta, Manitoba, Newfoundland and Saskatchewan)?

Outdoor wintering	Indoor wintering	Total

3. Which method of treatment did you use for **varroa control** in **2024**? *(Choose all that apply)*

Treatment	Beginning of beekeeping season	Mid beekeeping season (honey flow)	End of beekeeping season (late flow or no supers)
Apistan (Fluvalinate)	☐	☐	☐
CheckMite+ (Coumaphos)	☐	☐	☐
Apivar (Amitraz)	☐	☐	☐
Bayvarol (Flumethrin)	☐	☐	☐
Thymovar (Thymol)	☐	☐	☐

ApiLifeVar (Thymol)	☐	☐	☐
65% formic acid – 40 mL multiple applications	☐	☐	☐
65% formic acid – 250 mL single application (Mite Wipe)	☐	☐	☐
MAQS (formic acid)	☐	☐	☐
Formic Pro (formic acid)	☐	☐	☐
Oxalic acid – drip	☐	☐	☐
Oxalic acid – sublimation	☐	☐	☐
Hopguard II and 3 (Hop compounds)	☐	☐	☐
Other *(please specify)* ________________________	☐	☐	☐
None	☐	☐	☐

4. Please indicate the **number of times** you have carried out varroa monitoring, according to the method used, for each period in 2024.

Monitoring method	Beginning of beekeeping season	Mid beekeeping season (honey flow)	End of beekeeping season (late flow or no supers)
Mite fall/sticky board			
Alcohol wash			
Sugar shake			
CO2 roll			
Other			
None			

5. Did you monitor for varroa **before and after treatment** in 2024? *(Choose all that apply)*

	Before treatment	After treatment
Always	☐	☐
Sometimes	☐	☐
No	☐	☐

6. Which method of treatment did you use for **nosema** control in 2024? *(Choose all that apply)*

Treatment	Beginning of beekeeping season	End of beekeeping season
Fumagillin (antibiotic)	☐	☐
Other (*please specify*) ____________________	☐	☐
None	☐	☐

7. Did you apply the following **antibiotics** (prescription drugs) in 2024 for foulbrood diseases control? *(Choose all that apply)*

Treatment	Beginning of beekeeping season	End of beekeeping season
Oxytetracycline	☐	☐
Tylosin	☐	☐
Lincomycin	☐	☐
None	☐	☐

For those who applied an antibiotic for foulbrood:

8. Why did you apply an antibiotic for the control of **foulbrood** in your colonies in 2024? *(Choose all that apply)*
    - o To prevent foulbrood diseases
    - o To treat observed disease
    - o Both

For those who choose either "To treat observed disease" or "Both" :

9. Which disease did you observe?
    - o Signs of AFB
    - o Signs of EFB
    - o Unsure which foulbrood disease

10. To what do you attribute the main cause of death of your colonies in 2024-2025? (Please check every suspected cause and rank the causes according to their relative importance.)

	Cause of death	Rank (1 = the most important)
☐	Don't know	
☐	Starvation	
☐	Poor queens	
☐	Varroa and associated viruses	
☐	Nosema	
☐	Weather/climate	
☐	Weak colonies in the fall	
☐	Other (*Please specify*) ________________________	
☐	Other (*Please specify*) ________________________	
☐	Other (*Please specify*) ________________________	