

# Varroa Resistant Stock Survival

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## BC Bee Breeders Association Project

### How did the Varroa Resistant Stocks Survive Compared to the Controls?

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#### Project Background

The growing crisis among beekeepers in British Columbia and around the world caused by treatment-resistant Varroa mites led the BC Honey Producers Association (BCHPA) to recognize the need for Varroa-resistant queens in this province. During a BCHPA strategic planning session in 2003, beekeepers in British Columbia identified their number one problem as Varroa mites and overwhelmingly chose a breeding program as the best solution.

Over the next two years, several members of the BCBBA ran a cooperative program using Russian mite-resistant stock supplied by a Saskatchewan beekeeper. Although some participants of the study found that the Russian stock performed well for economic traits, the demands of their own businesses prevented the members from conducting properly recorded comparative performance trials for varroa resistance. The BCBBA Varroa Resistant Queen Testing Project (BC's VRQTP) study proposal, put together by Liz Huxter and John Gibeau, outlined a trial to help identify a varroa-resistant, hardy, productive stock for use by beekeepers throughout British Columbia.

In 2005, the BC Bee Breeders Association's VRQTP proposal for a three-year project was presented to the Beekeeping Industry Development Initiative (BIDI). BIDI agreed to underwrite the trial provided that there were donations of time, equipment and bees from Kettle Valley Queens (KVQ), and time by John Gibeau of the Honeybee Centre and Sol Nowitz of Jinglepot Apiaries. The BC Bee Breeders' Association (BCBBA), BC Honey Producers Association (BCHPA), and the Agri-Food Futures Fund (AFFF formerly named HURT) committed further support to create this joint venture between the federal Agri-Foods Canada body and the provincial BC Ministry of Agriculture and Lands who also backed the three-year project.

One of the BCBBA Varroa Resistant Queen Testing goals was to test different sources of varroa-resistant stocks in BC conditions. We brought in varroa-resistant queens from various sources: two sources in Ontario, one in Manitoba, two in Saskatchewan and two in BC. We also set up hives from three sources commonly used by BC beekeepers to serve as controls. Our project is built on the successes of many other Canadian and US breeding programs.

## Survivorship Results in Terms of the Lines or Sources of Stock

The table below (Figure 1) outlines the queen sources as letters a to j. The D1 (Vancouver Island), D2 (southern BC) and D3 (US offshore) sources represent the three control lines.

Figure 1: Survivorship of Varroa Resistant and Control Lines

Dates:	A Russ	B	C	Controls			E Berg	F Russ	G	H	J	Totals
				Vanc	S. BC	Off Sh						
July 2006	9	14	11	8	7	7	13	11	5	12	2	99
Sept. 2006	7	13	9	7	6	7	12	11	5	12	7	96
April 2007	6	12	9	7	6	6	11	10	5	12	7	91
Nov. 2007	4	9	5	6	3	4	6	7	4	8	3	59
April 2008	4	5	3	4	1	1	4	2	2	2	2	30
# of 2007 Queens	0	2	1	1	0	0	1	2	0	0	0	7
% Survival												
2006 to 2008	44%	36%	27%	50%	14%	14%	31%	18%	40%	17%		
>= 2 Frames of Bees	3	2	1	2	1	0	3	1	0	2	0	
# 2007 Queens	0	1	1	1	0	0	1	1	0	0	0	

[>> Click on the image above to enlarge](#)

The original 105 hives were started in May 2006, and in July the hives were requeened with the selected stock and mites were introduced into 99 units. By September, there were 96 hives. Some of the original queens were not initially accepted, so others from that line or from other resistant lines were introduced. One of the lines had had only 2 of 15 queens arrive alive in July. The breeder sent another set of queens, and 5 of those were introduced into hives found queenless in September. These hives, because of the period of queenlessness, started with lower varroa levels and so were not included in the data set for scoring hives for varroa resistance. We evaluated them for their economic characters. As a result, 96 hives went into winter in 2006.

The hive count in early April, 2007 was 91. One hive was dead and 5 hives were queenless. By May 2007, we had culled hives with 2 frames or less of bees. Over the summer, we lost two hives to swarming. We ended 2007 with 59 hives with selected stock other than the Varroa Sensitive Hygiene (VSH) hives.

Then in the spring of 2008, we lost 50% of the hives. We had sampled sites for Nosema infestations in the fall of 2007 and then again in the spring of 2008. The Ministry of Agriculture analyzed the samples for Nosema spores and found that the spore levels were quite high in the fall and very high by the spring – up to 68 million spores per bee in one of the dead hives. (See Figure 2.) We did not feed Fumidil in 2006 or 2007 because we are breeding for bees that are hardy, disease and pest-resistant.

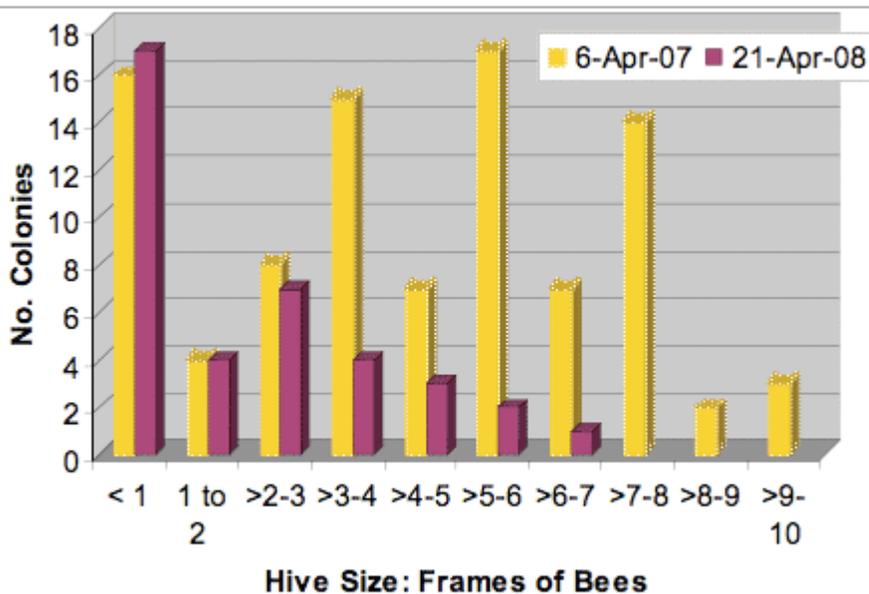
Figure 2:

## Nosema Levels Fall 2007 & Spring 2008

<i>Site</i>	<i>Date</i>	<i>Infest. Level</i>
Helm	9/13/07	10.2 million per bee
Doug	9/13/07	38.3
Duck (1)	9/13/07	7.6
Duck (2)	4/22/08	40.9
Wint	4/22/08	23.4
Pop	4/27/08	26.8
Hivelets N	4/26/08	24.8
Hivelets S	4/26/08	16.7
Bord N	4/26/08	21.7
Bord M	4/26/08	29.5
Bord S	4/26/08	18.3
Dead Hive 441	4/25/08	68.8

The bar graph below (Figure 3) shows the differences in hive size between the spring of 2007 and spring of 2008. This graphically illustrates the toll taken in both hive size and number this spring compared to last spring.

Figure 3:



If you look again at the survivorship table (Figure 1) which shows the percentage of hives surviving to the spring of 2008, you'll note that the Vancouver Island control line has one of the

highest survival rates.

As the bar graph of the size of surviving hives (Figure 3) shows, many of the surviving hives were quite small. The hives with two or more frames of bees in late April show that the lines with the greatest number of the larger hives were the Russian A and the Bergenske lines. The next table (Figure 4) shows the size of the largest hives with original selected queens. Note that the Bergenske stock has two of the three largest colonies.

Figure 4:

Hive No.	Site	Line	Frames Bees Apr 21
429	Winter's	A2	4
378	Shield's	A3	4.5
425	Winter's	A3	3
379	Shield's	B	4.5
391	Shield's	D1	4
407	Shield's	D2	3
384	Shield's	E2 Berg	6
26	Duck Pond	E3 Berg	6.5
424	Winter's	H	3
403	Shield's	H3	6

The surviving colonies were able to endure two winters. During the winter of 2006-7, the hives were wrapped with tarpaper, but in the winter of 2007-8, the hives were simply insulated on top of the hive and put together four to a pallet. The high losses over the last winter are mainly attributed to Nosema and possibly viral infections. The BC sourced queens show equal promise to the other varroa-resistant stocks brought in to test in southern BC.

The next article on the results of the BCBBA Varroa Resistant Queen Testing Project will discuss the Varroa Sensitive Hygiene stock and the results for those colonies.