



by DR. JOHN KEFUSS*

WHY A VARROA CHALLENGE?

From 1984 through 1991 we helped researchers test different chemicals against *Varroa destructor* on our bees in Toulouse France. During this period we became well aware of not only the advantages but also the problems associated with chemical control. Chances are good that either you have used or still are using some of the chemicals that we helped test¹.

Since 1993 we have been selecting bees for low receptivity and sensibility to *Varroa destructor* using the "Bond Test"². Over the years we have cooperated with colleagues testing bee races from Europe, Africa, North America, South America and Asia for their resistance to this mite^{3,4,5}.

In 1999 to speed up selection on my own bees I stopped all chemical treatments.

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This was not an easy decision for me to make. It took me about 3 years to decide. At that time I was told that I would lose everything, i.e., "No treatments ... No bees". However, I preferred to take that risk rather than continue to expose my bees and more importantly myself to the chemicals used against *Varroa*.

Because I couldn't buy *Varroa*-tolerant breeder queens, I knew that I would have to select for them myself and in addition develop new testing methods. I calculated that if I had a 10% survival rate I could run a breeding program for *Varroa* resistance. As a queen breeder I realized that even if all my hives died, I could always buy package bees from Italy and quickly get back into queen production. After a few years I had lost "only" two-thirds of my hives and to be honest I was "happy" with the results, which were much better than the 10% or less survival, that I had expected.

Since then, we have simply multiplied every year by naturally mating virgin

queens from the survivors that were the best honey producers with the least amount of *Varroa*, i.e., "cave man genetics". These queens furnish *Varroa*-tolerant drones for future matings.

At the present time our *Varroa* mite populations are low and under our conditions it is not economic to treat. In other words our bees are mite tolerant. Hygienic behavior at 24 Hours has improved, honey production is good and winter losses at 15% are less than the 23% for those in the same area that treat^{1,6}. Today we are back to the beekeeping situation as it was before the arrival of *Varroa* mites.

There is one point, however, you should always remember. Due to different environmental conditions what works for us may not work for you and vice versa. So it is important to select for resistance under your own conditions while maintaining as much genetic variability as possible.

You can select for resistance without knowing which of the many different re-

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World Varroa Challenge

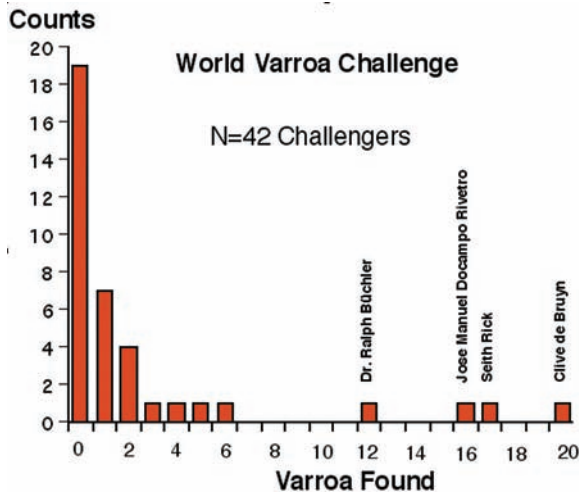
1 cent for every varroa you find from our hives

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(l) Fig. 1. A picture is worth one thousand words but a mite is worth one cent. (r) Fig. 2. To avoid a big fight in the bee yard we could not include results from a group of 13 Challengers: They found 12 mites, but contested who had found each mite.



(l) Fig. 3. World Champions Seth Rick (USA) 2nd place and Clive de Bruyn (England) 1st place. (r) Fig. 4. World Champions Juan Manuel Docampo Rovitro (Spain) 3rd place and Dr. Ralph B uchler (Germany) 4th place.

sistance factors you are selecting for. My associate Maria Bolt told me that “selecting for resistance is just like flying on a plane. You don’t need to know how the motor functions. The main thing is that you get to your destination.” From time to time you should count the amounts of adult, daughter and immature mites in the capped brood to see how your selection is progressing.

My impression is that most beekeepers really don’t know how much it costs them to treat and haven’t taken into consideration the negative effects that these chemicals are having on their hives. This is about as logical as someone who shoots himself in the feet with a shotgun and then complains that he has holes in his boots.

A fellow queen breeder told me that he had to cut his vacation short in order to treat for mites. I told him that if he did some selection he could save the money he spent on treatments and take his wife on a longer vacation. One beekeeper from Canada wrote me that it costs him between 10 to 15 dollars to treat each of his 15,000

hives. (For that amount he could take his wife on a really nice vacation. I hope she reads this!)

Our main *Varroa* problem today is that we don’t have enough mites. It is very important to maintain a constant selection pressure at all times on the hives. But it is not so easy to get live *Varroa*. I placed an advertisement in the French bee journals for two years in a row to buy live mites, but only two people answered. One said that he could not furnish the mites because he had just treated. The second proposed that I come to his place and collect the mites myself. I was wishing to buy mites by the thousands to dump into test hives to make certain that every hive had an equal chance to be infected. Several years later I found out from the Veterinary Inspection Service in Toulouse that they had received a lot of calls from all over France asking what was going on at my breeding station.

In the first years after our *Varroa* population crash we bought frames of *Varroa* infested brood from other beekeepers to reinfest the hives. Now we get free *Varroa*

from other beekeepers as we move our hives around for honey production. That reduces our *Varroa costs* and gives us a better and more diversified selection pressure under commercial beekeeping conditions.

The “Bond” or “live and let die test” gave us clear results in our selection against mites, but due to fear most beekeepers (and scientists) refuse to use it. In that sense it is not a good test. For them it is like learning how to swim by jumping into boiling oil. That is why we developed the “Soft Bond Test” which permits selection while limiting the financial and especially the “emotional” impacts of the “Bond Test”¹.

Bee breeders will not select for mite resistance unless they have an example that they can “touch” with their own eyes (or even more importantly with their own wallets). So we had to find an efficient way to let their “eyes touch” our results. According to Newton’s first law “a body persists in a state of uniform motion or of rest unless acted upon by an external force.” Our problem then was to find a force that could get the eyes of resting “bodies” (beekeepers and scientists) in motion. To do that we created the World *Varroa* Challenge using hard cash as a “soft” incentive.

METHODS AND MATERIALS

Notices were published in bee journals throughout the world inviting beekeepers and scientists to a “World *Varroa* Challenge” near Toulouse France (Fig.1). The 600+ hives were located in a 40 km wide X 150 km long North- South zone exposed to *varroa* infestations from other beekeepers. Challengers randomly chose their hives and the time they wished to spend controlling for *Varroa* adults on the bees and in the brood. Each challenger was given a detailed explanation of the selection techniques we use justified by data, so that if they wished, they could try our methods when they returned home.

To incite maximum participation by bee-



Fig. 5. Future bee experts Timoth e and Geoffrey Misslin?

keepers and scientists, one cent (in euros) was paid for every varroa mite that was found dead or alive according to the maxim "Put your money where your mouth is." A provisional budget of 100 cents was reserved to cover the costs of paying for all mites found. Female mites weigh between 0.5 mg and 0.2 mg, depending upon whether or not they are pregnant⁷. This comes out to 20,000-50,000 euros for a kilo of varroa mites (about 13,000-32,000 US dollars per pound). In addition, free meals and hay to sleep on were provided.

RESULTS

Fifty-five challengers came from France, Germany, China, England, Wales, Poland, USA, Scotland, Morocco, Switzerland, Sweden and Spain. The challengers required more than 100 hours of inspection to find 109 mites (Fig. 2). The provisional budget was exceeded by 9%.

Winners were Clive de Bruyn (England) 20 mites, Seth Rick (USA) 17 mites, Jose Manuel Docampo Rivetro (Spain) 16 mites and Ralph B uchler (Germany) 12 mites (Fig.3, 4)

The Challenge convinced some beekeepers and scientists that they could use the "Soft Bond Test" in their own breeding programs. One scientist went back to China and trained 400 beekeepers in the technique. Others publish information on the "Soft Bond Test" in their national bee journals. Their "eyes were touched".

DISCUSSION

Most challengers (even those who did not find any mites) were happy with their results. It was suggested that given the amount of effort required to find a mite, a payment of one euro per mite would be more equitable, but still not enough (that comes out to 2 to 5 million euros per kilo of *Varroa* mites). As a selection program advances, fewer mites will be found. So this is a point that organizers of future World Varroa Challenges might wish to consider. In addition, potential customers would be able to rank queen breeders by how much they were willing to pay for mites during the Challenge.

When Apimondia holds its next congress, the beekeepers and especially the queen breeders in that country should organize a "World Varroa Challenge". The next Apimondia congress is in Argentina in 2011. Then in Ukraine in 2013. Are there any beekeepers in Argentina or Ukraine who are willing to organize a "World Varroa Challenge"? This would be a good chance to show the world what you can do.

CONCLUSION

At one time chemical treatments were the only option against mites. We now know from breeding projects in different parts of the world and from our own that it is possible to select bees against *Varroa destructor*. For this reason we believe that it is the moral responsibility of everyone who breeds bees to try to select for resistance to



Fig. 6. The poster we created from photos of participants in our "World Varroa Challenge" near Toulouse, France in 2009.

reduce the impact of chemicals in hives. We owe this effort to future generations of beekeepers (Fig. 5).

**We hope that YOUR
"Eyes have been Touched"**

REFERENCES

1. Kefuss J., Vanpoucke J., Bolt M. and Kefuss C. (2009). Practical Varroa Resistance Selection for Beekeepers. In Scientific Program of the 41st Apimondia Congress, Montpellier, p82 (see www.apimondia.org)
2. Kefuss, J., Taber III, S., Vanpoucke J. and Rey F. (2003) Breeding for varroa resistance: How we do it. Paper no. 187, XXXVIIIth Apimondia Congress, Ljubljana, Slovenia.
3. Koeniger, N., J. Schmidt, J. Wilde, J. Kefuss, J. Ducos de Lahitte, (1995).

Testing bees from Uruguay for tolerance against varroaosis in Europe. *Pszczeln. Zeszyt. Nauk.* 39(1): 121-131. [In German with English abstract].

4. Kefuss, J., Vanpoucke, J., Ducos de Lahitte, J. and Ritter, W. (2004) Varroa tolerance in France of *Intermissa* bees from Tunisia and their naturally mated descendants: 1993-1994 *American Bee Journal*, v. 144 no.7: 563-568
5. B uchler, R., Berg, S., Kezic, N., Pechhacker, H., van Praagh, J., Bubalo, D., Ritter, W., Bienefeld, K. (2002) Island project in Croatia: Test of European honeybee strains for *Varroa destructor* tolerance. *Apidologie* 33, 493-494
6. Britten, V. (2008) Pertes de Cheptel-hiver 2007-2008, *La Gazette de l'ADAM* (18) December, Toulouse France, p.23
7. Sammataro, D. (2010) USDA Tucson Arizona Personal communication