

The Bee Diet (Feed Bee®): A Positive Report on Progress.

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It is about two years ago since Abdolreza Saffari approached me to work on his ideas for an improved pollen substitute diet in my laboratory. At that time, I had no funds to support him, but he brought with him some initial support that allowed us to kick-start the project. We received encouragement from the OBA, and worked together on a proposal to be submitted to the IRAP (Industrial Research Assistance Programme) of the National Research Council. Dr. Jim Atkinson, an expert in small animal nutrition in the Department of Animal and Poultry Science joined in the research as Saffari developed his ideas. The team grew as industry partners also became involved, and Ontario's beekeepers offered generous help by way of access to their bee yards. We were also able to pay for use of a modest number of hives at the University of Guelph through a small amount of discretionary money I could muster. **What have been the results?**

Defining the Diet. Saffari's first task, using his experience in animal nutrition from his education in Iran, and his interest and ideas for feeding honeybees, was to formulate the new diet. That was accomplished through a three-pronged attack on what was already known that could help solve the problem. Saffari synthesized and summarized what was known about the nutritional composition of natural bee food (pollen). He compared those findings with what was known about the nature and practical value of various bee diets and pollen substitutes that were described in the literature. At the same time, he synthesized and summarized what is known about the nutritional requirements of honeybees, as brood and as adults. By integrating all that information, the scientific formulation of the first trial batches of Feed Bee® could start.

Feeding the Diet & Feeding Rates. Our first experiments, at the University of Guelph, investigated the feeding rates of bees in hives fed patties made of our Feed Bee®, Bee-Pro® (by Mann-Lake), and natural (bee-collected) pollen in fall 2003. The results were excellent. It was clear that Feed Bee® was taken by the bees at the same rate as was pollen, and both far exceeded the "take-down" rate of Bee-Pro® which, at one-tenth the rate, was hardly consumed. We published the results as a note (Saffari *et al.* 2004), and the telephone started to ring. There was huge interest in experimental, pre-Feed Bee®, diet. In fact, interest outstripped our capacity to hold back until a more refined pollen substitute was formulated, so shipments were made, perhaps prematurely. Nevertheless, the responses we received were generally positive.

The next year, we started with a much expanded set of experiments. Consumption rates of patties were compared again, and the results much the same as those from 2003. We also experimented with dry powder feeding from Lalonde feeders (Lalonde Sales Prt., Clavet, SK). We did not test pollen in those feeders (too pricey for our modest research budget), but we did test Bee-Pro® and TLS' (Lalonde Sales Prt., Clavet, SK) bee food. Two methods were used, some apiaries were fed only one kind of feed (no choice) and other apiaries were given a choice of the three feeds (choice). The results were definitive: comparisons between the average use per colony of the feeds in the "no choice" apiaries showed Feed Bee® was taken at 4 to 8 times the

rate as the other two feeds; in the “choice” apiaries the results were even more dramatic with Feed Bee® taken at 8 to 17 times the rate of the other two feeds.

Feed Bee® & Body Condition in Individual Honeybees. While I was in Brazil in 2003, I was chatting to David De Jong from the bee biology group at the University of São Paulo in Ribeirão Preto about our respective programmes. I mentioned to him our work on the new diet. He requested that some Feed Bee® be sent to him to test. We were only too happy to oblige. David’s team examined the body condition of individual Africanized honeybees by extracting haemolymph (blood) from individual bees kept in his laboratory and fed different materials. The haemolymph was tested for the amount of protein present. The results again were highly positive. The bees fed Feed Bee® had the highest levels of body protein, only slightly higher than for those fed Bee-Pro®, but about 50% higher than in those fed pollen, and about 3 times those fed only sugar syrup (De Jong *et al.* Submitted). Protein in the bodies of adult bees is important to their overall health, and naturally to their capacity to feed and raise brood.

Brood & Colony Populations. Feed Bee® encourages brood-rearing, too. The expanded set of experiments in 2004 was designed to assess whether or not the apparently beneficial affects of our pollen substitute diet carried through to increased brood production and overall higher populations of bees in the hives. To obtain the necessary control on the experiments, we used patty feeding with Feed Bee®, Bee-Pro®, pollen, and no supplemental food.

To assess brood production, we developed a novel method for measuring brood areas by digital photography and computer-aided planimetry (measurements of areas). The method uses a stand that holds the frame to be measured, and the camera to capture the image of the frame in a standardized manner. The stand also allows easy rotation of the frame so that both sides can be assessed quickly with two digital photographs. The stand and method allowed for thousands of measurements of brood area to be made, the data logged into computer-based spread-sheets and then statistically analysed. Jennie Knopp played a major role in developing user-friendly computer software for the task (Knopp *et al.* Submitted).

The populations of bees in hives were estimated by weight.

The results of our tests are clear. Colonies fed with Feed Bee® and with pollen produced about twice as much brood, and had almost twice as many bees than did those fed Bee-Pro® or given no supplemental feed.

Honey Production. Our final assessment of the value of Feed Bee® was through measures of honey production. As might be expected, with the higher populations of bees in the hives, greater honey production resulted. Feeding both pollen and Feed Bee® resulted in hives that almost twice the honey production of hives fed with Bee-Pro® or not given supplemental feed.

IN SUMMARY, Feed Bee® is a palatable and highly acceptable pollen substitute that can be fed to honeybee colonies in spring or fall. It is taken by the bees with at the same rate as

pollen, when both are fed in patty form. It is more rapidly consumed than are other pollen substitutes tried when given in patty form or in open dry-powder feeding trials. Feed Bee® has at least the same nutritive value (as judged by protein in the bees' bodies) as pollen or Bee-Pro® when fed to bees in laboratory cages. Those benefits follow through into brood production, populations of worker bees, and to honey production in hives in actual, commercial, apiary management conditions. The details of our experimental results will be presented in Saffari's dissertation, which is well on its way to completion, and then in the apicultural literature. Already, the value for helping with spring build up and overwintering strength are proven. Although Feed Bee ® is available on the market now, we expect that more trials, and some refinements will increase the value of the product to beekeepers.

References

De Jong, D., D. E. Junqueira da Silva, A. M. Saffari, P. G. Kevan & J. L. Atkinson (Submitted). A promising new pollen substitute for honey bees enhances hemolymph body protein level

Jennie Knopp, J., S. M. Abdolreza, P. G. Kevan, & J Boone (Submitted). Semi-automated measuring of capped brood areas by digital photography: How to make the photography stand, take the pictures, and analyse them quickly and easily.

Saffari, A. M., P. G. Kevan, & J. L. Atkinson. 2004. A promising pollen substitute for honey bees. *American Bee Journal* (March 2004): 230 - 231.

Saffari, A. M., P. G. Kevan, & J. L. Atkinson. 2004. A promising pollen substitute for honey bees. *The Sting: Voice of the Ontario Beekeepers' Association* 22 (4): 19 - 20.

Saffari, A. M., P. G. Kevan, J. L. Atkinson & E. Guzman-Novoa. (Submitted). Feed-Bee®: A highly palatable pollen substitute for open or dry feeding.