



*A yard with one pollen supplement feeder in no-choice feeding.*

**SUMMARY**

A new pollen substitute diet (named **Feed-Bee®**) has been developed at University of Guelph from current knowledge of honey bees' nutritional needs, and the composition of natural pollen and existing supplementary feeds. Its development incorporates the science and technology of animal and insect diets. In previous experiments, Feed-Bee® was fed in patties to colonies of honey bees and its palatability was compared with patties of pollen and a commercial diet, Bee-Pro® (Mann Lake Ltd, Hackensack, MN). Pollen and Feed-Bee® were equally well accepted by bees. The rate of feed intake (600g and 559g/colony/9-14 days) for both pollen and Feed-Bee® was highly significantly greater than for Bee-Pro® (27.3g/colony/ 9-14 days).

In order to test the palatability of the new diet in powder/dry form another feeding trial was made in commercial apiaries in early Spring 2004. In this trial, three different feeds, Feed-Bee®, TLS Bee food (Tony Lalonde Sales Prt., Clavet, SK) and Bee-Pro® were fed to 153 colonies in 15 beeyards. Two methods of feeding were used: 1) No-choice feeding, where each yard received only one of the three feeds, and 2) Choice feeding, where each yard received all the three experimental feeds throughout the experimental period (March 25<sup>th</sup>-May 6<sup>th</sup>). The mean feed intake of Feed-Bee® was 960g and 883g/colony/six weeks for first and second feeding methods respectively. These amounts were significantly ( $P < 0.0001$ ) greater than for the other two feeds. The amount of Bee-Pro® consumed in the two feeding methods was 224g and 238g/colony/six weeks and for the TLS Bee food, 115g and 120g/colony/six weeks respectively. These results show that Feed-Bee® is highly palatable to honey bees if fed in powder/dry as well as in patty form.

Key words: pollen, substitute diet, feed, honey bees, palatability

**INTRODUCTION**

The development of a pollen substitute for honey

1) Department of Environmental Biology, 2) Animal and Poultry Science Department: University of Guelph, Guelph, Ontario, N1G 2W1, Canada.  
amsaffari@yahoo.com / (asaffari@uoguelph.ca)  
pkevan@uoguelph.ca  
jatinkins@uoguelph.ca  
eguzman@uoguelph.ca

# FEED-BEE

## A New Bee Feed Is Added To The Menu

Abdolreza M. Saffari<sup>1</sup>,  
Peter G. Kevan<sup>1</sup>, James L.  
Atkinson<sup>2</sup>, Ernesto Guzman-Novoa<sup>1</sup>,



*A yard with three pollen supplement feeder in choice feeding.*

bees has long been an area of interest to the beekeeping industry. The possibility of improving the efficiency of beekeeping by maximizing honey production and crop pollination, to overcome pesticide damage and produce strong colonies against parasites, for package-bee production, and disease resistance lies, in part, in the development of an effective pollen substitute to feed the colonies when pollen is scarce. The key to producing efficient feed for animals, including insects, is ob-

**Table 1.** Mean feed-intake of three pollen substitutes by 153 hives during two feeding methods (no-choice, choice) in six weeks period

Given Feeds	No-Choice Feeding g/colony/6 weeks	Choice Feeding g/colony/6 weeks
Feed-Bee®	960 a ± 0.01	883 a ± 32.9
Bee-Pro®	224 b ± 0.04	106 b ± 7.1
TLS Bee food	115 b ± 0.01	52 b ± 1.5
<b>Treatment Effect</b>	$F_2 = 20.12 P < 0.0001$	$F_2 = 241.07 P < 0.0001$

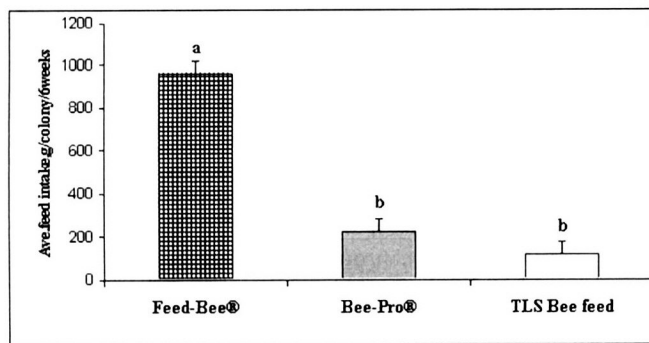
*Different letters after each value indicate a significant statistical difference between them by GLM Process*

viously through using the very best ingredients with regards to palatability, health and overall cost (Wilson *et al.*, 2005; Macdonald *et al.*, 2002; Forbes, 1995).

There is no doubt, however, that even the most nutritious feeds, which contain all the required nutri-

ents, have no beneficial value for the animals, if the feed doesn't reach their digestive tracts. In other words, the value of a feed is countered if it is not accepted by the animal (Wilson *et al.*, 2005; Macdonald *et al.*, 2002; Forbes, 1995).

Our main objective in formulating Feed-Bee<sup>®</sup> was to produce a highly palatable and nutritionally balanced diet for honey bees by exploiting the combined science and technology of animal and insect nutrition (Wilson *et al.*, 2005; Cohen, 2004; Herbert, 2000), pollen chemistry and biochemistry (Somerville 2001; Roulston & Cane, 2000), animal feed ingredients and insect feeding behavior (Wilson *et al.*, 2005; Cohen, 2004; Macdonald *et al.*, 2002), nutrient digestibility and palatability (Wilson *et al.*, 2005; Macdonald *et al.*, 2002; Herbert, 2000; Forbes, 1995), and incorporating a wide range of ingredients. After we had arrived at a formulation for the new diet (Feed-Bee<sup>®</sup>), which recent tests have shown to be highly nutritious (De Jong *et al.* Submitted) one of our primary concerns was to examine its palatability. We initiated our field research (Saffari *et al.*, 2004) in the late Fall of 2003 with "take-down" test, by which Feed-Bee<sup>®</sup> was given to the experimental colonies in patty form inside their hives. Its performance was compared with that of patties of pollen and Bee-Pro<sup>®</sup> (Mann Lake Ltd, Hackensack, MN). The feed intake (600g and 559g/colony/9-14 days) for pollen and Feed-Bee<sup>®</sup> was significantly higher than (27.3g/colony/9-14 days) for Bee-Pro<sup>®</sup>. To measure the palatability of Feed-Bee<sup>®</sup> in powder/dry form (open feeding) we compared its consumption with two other diets, Bee-Pro<sup>®</sup> and TLS Bee food (Tony Lalonde Sales Prt., Clavet, SK). We made the palatability test using bees in commercial apiaries where actual usage of pollen substitutes takes place.

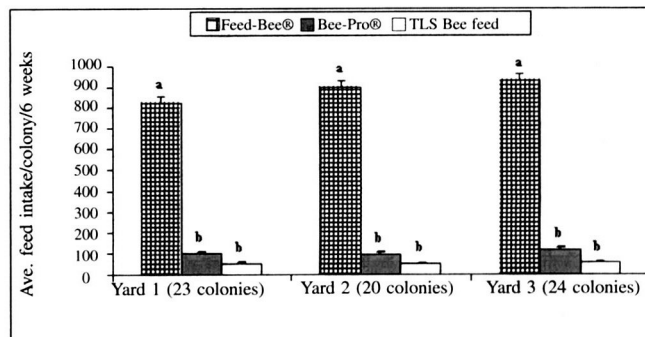


## MATERIALS AND METHODS

Two types of open feeding methods were used. Feed-Bee<sup>®</sup>, Bee-Pro<sup>®</sup>, and TLS Bee food in powder/dry form were provided in pollen supplement feeders (Figs. 1 and 2) (from Tony Lalonde Sales Prt. Clavet, SK) over six weeks (March 25<sup>th</sup>-May 6<sup>th</sup>) in 2004.

The methods were:

1. No-choice feeding. In this method we used 12 commercial beeyards randomly assigned to one of three groups. Each group of yards received only one of the feeds in a single pollen supplement feeder located in the middle of the yard.
2. Choice feeding. In this method we used three commercial yards, each received all three of the feeds in separate pollen supplement feeders located in the middle of each yard.



## RESULTS AND DISCUSSIONS

The feeding trials were made at a time when there were no natural pollen sources available and the weather was warm enough (except some rainy or brisk days) for bees to leave the hives and collect the pollen substitutes at the feeders. The feeders filled with Feed-Bee<sup>®</sup> were visited more frequently by bees throughout the experiment, for both the no-choice and choice feeding methods.

The average consumption for Feed-Bee<sup>®</sup> was 959g/colony/six weeks in the no-choice feeding and 883g/colony/six weeks in the choice feeding trial. The feed intake for Bee-Pro<sup>®</sup> was 224g and 106g/colony/six weeks and for TLS Bee food it was 115g and 52g/colony/six weeks in no-choice and choice feeding methods respectively (Table 1). The mean feed intake for Feed-Bee<sup>®</sup> was significantly ( $P < 0.0001$ ) higher than for other two feeds. These results indicate that Feed-Bee<sup>®</sup> is highly palatable and very well accepted by bees, making it a highly promising pollen substitute. This result is consistent with the result of our previous feeding trial (Saffari *et al.*, 2004), where Feed-Bee<sup>®</sup> and pollen as patties were equally well accepted by bees.

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