A Promising Pollen Substitute for Honey Bees

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Summary

A new diet has been developed from knowledge of what is known about honey bees' nutritional requirements, the composition of natural pollen and of existing supplementary feeds. Incorporating scientific dietetic principles by which diets for domesticated animals and insects have been developed in the past has resulted in a feed formulation with excellent potential. The Feed (nicknamed Feed-Bee) was given to experimental colonies and compared with pollen and Bee-Pro® (Mann Lake) in patty form. The feed intake for pollen and Feed-Bee was significantly higher than Bee-Pro®. The preliminary results suggest that, Feed-Bee is highly palatable as both pollen and Feed-Bee are equally accepted by bees.

Key words: Pollen, substitute diet, honey bees, feed intake.

Introduction

Major issues confronting beekeeping are to have strong honey bee colonies for over-wintering combined with rapid spring build up in time for early pollen and nectar availability and to provide pollination services on early blooming crops (e.g. in orchards). The possibility of improving the efficiency of beekeeping by maximizing honey production, crop pollination, to overcome pesticide damage and produce strong colonies for package-bee production, lies in the development of an effective pollen substitute to feed the colonies when pollen is in scarce. There are various supplementary diets advocated and commercially available, but most appear to be variously nutritionally poor or unpalatable and are not well tested. Based on the principles of dietetics (House, 1961, Jouanin, 2000, Cohen, 2003, Carter, 2003 Dadant, 2000, NRC 2003), knowledge of pollen chemistry and biochemistry (Roulston & Cane, 2000, Winston, 1987), nutrient accessibility (Baker & Baker, 1983), palatability approach (Macdonald 2002, Cheeke,1999) a scientifically formulated diet was developed. Our overall concern is to develop and test a highly palatable and nutritionally balanced diet for honey bees. After we had arrived at a formulation for a new diet (which we have nick-named Feed-Bee), our primary concern has been to assure its palatability. We initiated our field research in fall 2003 with "take-down" tests, the results of which are sufficiently positive to warrant being reported now.

To measure the palatability we compared the consumption of Bee-Feed with two other feeds, pollen and Bee-Pro® in patty form.

Materials and methods

Twenty-eight colonies with one honey super with and a 10-framed brood chamber (3 brood, 4 honey frames, two empty frames) and one honey super (3 honey and 6 empty frames) were equalized at the University of Guelph apiary. The colonies randomly received one of three treatments: pollen, new diet, Bee-Pro®.

The three feeds, new diet, pollen and Bee-Pro® were fed to experimental colonies in the form of patties. Patties had similar consistency and were prepared as follows:

1. The new diet patty was 330g of new diet powder mixed with sugar syrup (60% w/w) in the ratio of 1: 1.13, respectively.
2. The Pollen patty was 340g of powder mixed with sugar syrup (60% w/w) in the ratio of 1: 0.89, respectively.
3. The Bee-Pro® patty was 370g of powder mixed with sugar syrup (60% w/w) in the ratio of 1: 1.89, respectively.

The patties were spread on wax paper (30 x 20 x 1 cm) and put on the top bars in the hive.

Feeding was done in the fall 2003. In the initial feeding patties were supplied to all colonies. At 2-3 day intervals colonies were monitored and when the pollen patty was completely consumed, the patties were collected and weighed. During the second feeding, the treatments were repeated for all groups. Fourteen days post-feeding all remaining patty material was collected from the colonies and weighed.

Results and discussion

During the 9 day interval Feed Bee® and pollen groups consumed their entire patty, whereas, only 0.87g of Bee Pro®

Feed	1st feeding duration	Given feed (g)	Feed intake (g)	2nd feeding duration	Given feed (g)	Feed intake (g)
Feed Bee®	9 days	330	330	14 days	280	258.547
Pollen	9 days	340	340	14 days	300	259.84
Bee-Pro®	9 days	370	0.87	14 days	250	26.42

Table 1 The amount of new diet, Pollen and Bee-Pro® given (g) and consumed (g) over two time intervals, 9 and 14 days.

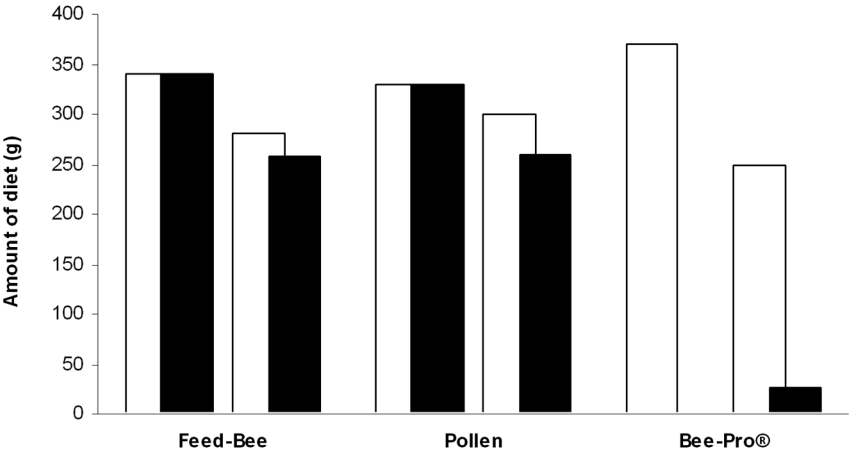

Fig. 1 The amount of new diet, pollen and Bee-Pro® patties given (□) and consumed (■) at the first (A) and second (B) feeding duration.

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was consumed (Table 1 and Figure 1). After the second feeding, the feed intake was 258.54g, 259.84g and 26.42g for Feed Bee®, pollen and Bee-Pro® groups, respectively. The total feed intake was 588.54g for the Feed Bee® group, 599.84g for the pollen group and 27.29g for the Bee-Pro® group. The feed intake was significantly different ($p<0.05$) between Bee-pro® group and the other two groups. There was no significant difference in the amount consumed between the pollen and new diet groups.

Our results indicate that the new diet and pollen are equally accepted by the bees. The new diet is, thus, as highly palatable as natural pollen and easily provided as patties to colonies in standard hives. We eagerly await spring when the strengths of the experimental colonies can be measured and the worth of our Bee-Feed assessed.

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