

# Pollen Patties

**Milling pollen does not make patty supplements less attractive to bees: A challenge to the chocolate chip theory.**

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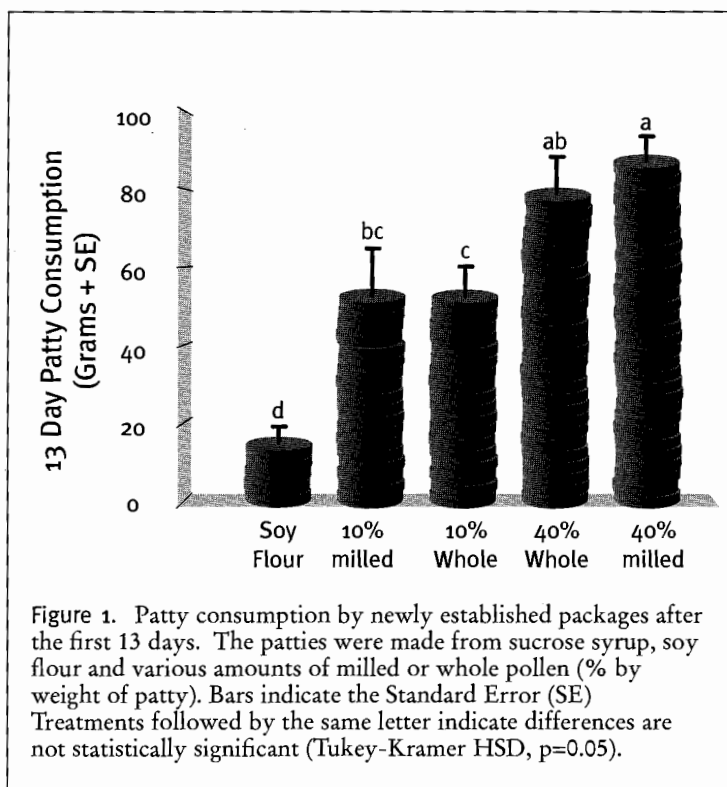


Figure 1. Patty consumption by newly established packages after the first 13 days. The patties were made from sucrose syrup, soy flour and various amounts of milled or whole pollen (% by weight of patty). Bars indicate the Standard Error (SE). Treatments followed by the same letter indicate differences are not statistically significant (Tukey-Kramer HSD,  $p=0.05$ ).

There are a number of beekeepers who hold the firm conviction that milled pollen results in a less attractive patty supplement. It has been suggested to me on several occasions that whole clumps of pollen in a patty are like the chocolate chips in a cookie to a honey bee. Use powdered pollen in the mix, I am told, and your “chocolate-chip cookie” will degenerate into a distasteful “puck” of brewers yeast, soy flour and ground up pollen. The difference, they exclaim, is dramatic.

The attractiveness of supplements is far from a mere academic issue. The

faster a supplemental patty is consumed, the larger the population of bees your colonies will rear. These are the findings of the Israeli scientist Dr. Yolanda Lehner (1983). She found that the amount of brood reared in colonies did not depend on the type or amount of protein in a supplement, but on how much protein was consumed over a given time. She observed that regardless of what diet she fed, colonies in her study produced an average of 25 bees for each gram of protein in the supplement. Nonetheless, she found that the most brood was reared in colonies fed an attractive diet, specifically a

supplement containing 50% pollen. Colonies fed a pollen diet ate more of the diet, and consequently, produced three times as many bees than diets containing only yeast or soy flour, even though the amount of protein in the diets was identical. The increased brood, Dr. Lehner contends, is almost entirely the consequence of bees eating the pollen supplement at a faster rate.

Does milling pollen dramatically decrease patty consumption and, as a consequence, reduce the potential for maximizing brood production? The opportunity to test whether milled pollen decreases the attractiveness of patties came from American foulbrood research being conducted at our research facility by Dr. Stephen Pernal. Steve wanted to know if formulating antibiotics in pollen patties decreased the residue of antibiotics in harvested honey compared to the traditional treatments of sugar dusting or syrup treatments. Preliminary results of this residue work have since been published in *Hivelights* (Pernal, 2004). Before these important experiments could occur, however, a patty recipe that would ensure the entire antibiotic would be consumed in a short period of time needed to be determined.

On the hunt for a rapidly

consumable patty, Dr. Pernal and I tested five patty recipes in an experiment involving 43 newly-established packages at the end of April 2002. These patties contained 0, 10 or 40% whole, milled pollen (particle size < 0.85 mm) (Table 1). Apart from the pollen, these patties contained approximately two parts 1:1 sucrose syrup to one part soy flour. Patties of each type, weighing approximately 100 grams, were mixed and formed by Medivet Pharmaceuticals, High River, Alberta. The patties were applied to the top bars of each colony on a piece of wax paper. The consumption rate of patties was determined by weighing what remained of the patty at 2, 4, 10 and 13 days after they were first applied.

Although bees consumed the various patties at different rates (figure 1,  $F = 8.17$ ,  $df = 4, 128$ ,  $P < 0.001$ ) milling the pollen did not influence patty consumption. Patty consumption rate, however, increased dramatically with the addition of larger amounts of pollen (Figure 2). For each 1% increase in pollen, colonies consumed 1.35 times more patty supplement over the 13 days of the experiment. These results are striking; the 100 gram patties containing 40% pollen were completely consumed in only two weeks after they were applied, whereas the patties containing 10% pollen took about a month. Although the 10% pollen patties were consumed slower than the 40% pollen patties, twice as much of the 10% patties had been eaten after 13 days compared to patties lacking pollen (Figure 1).

Returning to the cookie metaphor, it is clear that the amount of chocolate (pollen)

constitution	# colonies
Soy flour (no pollen)	8
10% milled pollen	8
10% whole pollen	9
40% milled pollen	9
40% whole pollen	9

Table 1. Five different types of soy flour patties were applied to newly hived package colonies in April 2002. The patties varied with respect to the amount of pollen (0, 10 or 40%) and whether the pollen was milled or mixed whole.

in a cookie is critical. Whether the pollen is whole or in the form of tiny particles, appears to be unimportant- at least to bees. Milled pollen, however, is easier to formulate in industrial or pharmaceutical settings where even small inconsistencies in pollen content among batches may be unacceptable. Our finding may help facilitate the controlled pharmaceutical formulation of pollen supplement patties for delivering antibiotics.

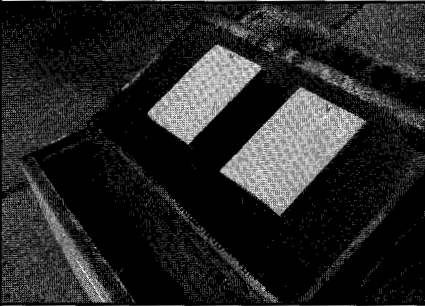
For beekeepers our findings hold two important messages. Firstly the chocolate chip cookie theory has been overturned and you should now feel confident that milled pollen will not

affect the attractiveness of your patties to your bees. More importantly, however, our findings suggest you would benefit by increasing the amount of pollen in your supplemental spring patties. The addition of 40% pollen to a patty would result in your bees eating an additional 54 grams of patty every two weeks. If you assume a typical patty contains 15% protein, Dr. Lehner would predict the addition of 40% pollen would result in the rearing of about 200 more bees over the same two weeks than if you had left the pollen out. Your \$0.72 investment in 40% pollen for each 100g patty you make (pollen costs \$8.25 per pound) will return you \$2.00 increase in bees (packaged bees cost \$30 per pound (per 3,000 bees)); a 280% return on your investment. The additional brood rearing boost from adding pollen to your supplemental patty mix will result in larger and more productive colonies come summer and with high honey prices, this means cash in your pocket.

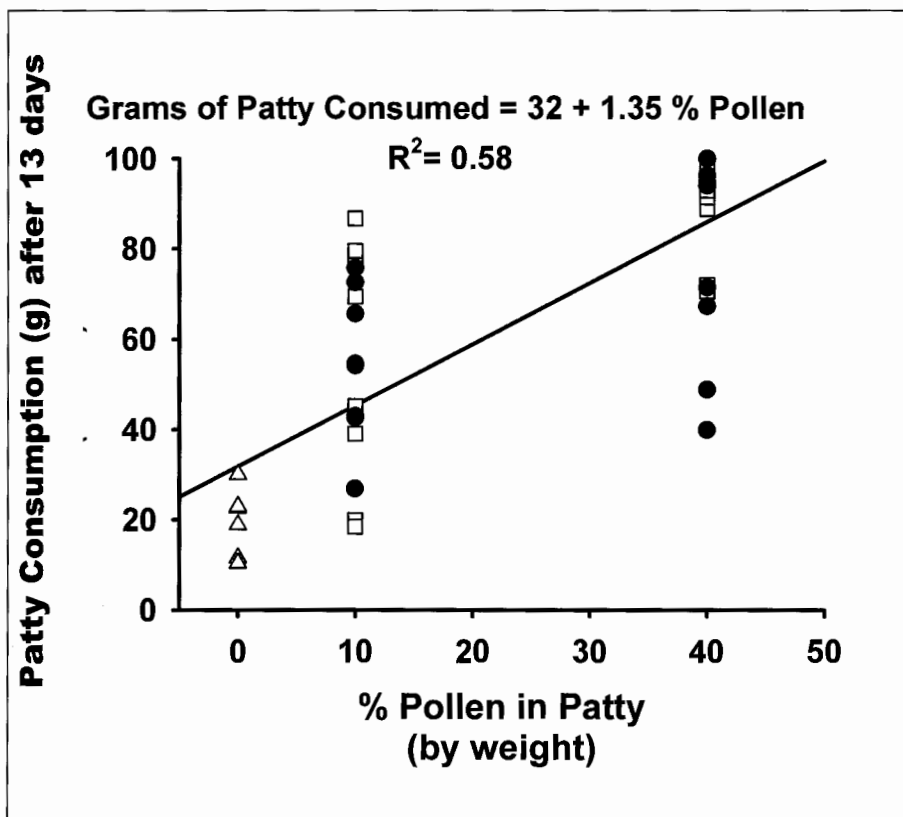
Reference:  
Lehner, Y. 1983. "Nutritional considerations in choosing protein and carbohydrate sources for use in pollen substitutes for honeybees." *Journal of Apicultural Research*. 22: 242-248.

Pernal, S. and A. Melathopoulos. (in press) "Integrated Management of Oxytetracycline-resistant American Foulbrood (AFB) Disease in Honey Bees." *Proceedings of Bee Research Symposium*, Winnipeg, MB, 28-29 January 2004.

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### Grams of Patty Consumed

Figure 2. The effect of pollen concentration on patty consumption over 13 days. Consumption rates for the three percentages of pollen content (0, 10 and 40%) were determined by linear regression of patty consumption over 13 days vs. percentage pollen. Patties containing milled and unmilled pollen and the same concentration of pollen were pooled for the analysis. The symbols on the graph signify colonies fed patties with no pollen (white triangle), milled pollen (white squares) or whole pollen (black circles). The regression indicates that for each percentage increase in pollen concentration, there is a 1.35 times increase in the grams of patty supplement consumed over 13 days (not including the addition of 32 g for the y-intercept). The regression model is highly significant ( $F = 55$ ,  $df = 1, 42$ ,  $P < 0.001$ ). The y-intercept term and slope are different than zero ( $t = 6.59$ ,  $P < 0.001$  and  $t = 7.48$ ,  $P < 0.001$ , respectively).

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