

Is There A Pollen Substitute Equal To Pollen?

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The question of pollen substitutes is and has been a very important one for beekeepers. In many localities in the spring and in some places during other parts of the year there is a scarcity of pollen in nature. Thus, colonies of bee, which depend on pollen for their growth and development, are considerably weakened. This results in a poor honey crop, because a small population of field bees can not utilize the nectar sources to the same degree as the colonies with a large number of bees. Giving a good pollen substitute at such time will make the difference between a good honey crop and a failure.

In beekeeping literature we find many controversial reports on the practical results of feeding pollen substitutes. Some beekeepers report a tremendous buildup of those colonies while others are very much disappointed in the results. The question arises: is there really a pollen substitute equal to pollen?

For a number of years this question has been studied at the Minnesota Agricultural Experiment Station of the University of Minnesota. Small colonies, consisting of about one and a half pound of freshly emerged bees, which have never eaten pollen, were placed in nuclei kept in caged compartments and fed various pollen substitutes mixed with honey to make candy of proper consistency. Their brood production was followed and recorded.

In comparing pollen substitutes and a pollen supplement, it was found that a pollen substitute, consisting of a mixture of soybean flour and dried brewers' yeast was twice as efficient in the production of bees as was a pollen supplement having one year old pollen from pollen traps mixed with soybean flour in the same proportion as the pollen substitute.

Next the pollen substitute was compared with the bee bread offered in combs to the experimental bees. The

results showed that bee bread was about nine times as efficient as the pollen substitute. Addition of 10% pollen from pollen traps increased the value of the pollen substitute about twice. What is the cause of such a difference? It is possible that the proteins of the pollen substitute do not provide, in sufficient amount, all the components necessary for the growth of bees. For this reason the pollen substitute was fortified with dry skim milk, which has a good quality of proteins. Moreover, the pollen substitute candy given to the bees has only 12% protein, while bee bread, on an average, close to 20%. Therefore, it was decided to increase also the protein content of the pollen substitute by adding finely powdered commercial casein to it.

The results showed that a simple addition of dry skim milk considerably improved the diet. Further increase in the protein content by an addition of commercial casein gave still better results, the relation being 1:1.8:2.2 for pure pollen substitute, that fortified with dry skim milk and the pollen substitute further fortified with commercial casein.

Finally these improved pollen substitutes were compared with the air-dried pollen collected at the time of

the experiment from the traps in the apiary. The results are presented in Table 1.

From this table it is evident that the pollen substitute fortified with commercial casein was not inferior to pollen used at the same time by the colonies in the apiary. However, the bees fed pure pollen consumed about twice as much food as those given the pollen substitute.

For practical purposes a pollen substitute consisting of *three parts soybean flour* (expeller processed or solvent extracted and heated afterwards with fat content 5-7%), *one part dried brewers' yeast* (bitter, for animal feeding) and *one part of dried skim milk* could be recommended. An addition of 10% dried egg yolk and 10% finely ground commercial casein will improve the food value of the mixture. However, the latter two constituents are rather expensive (dried egg yolk, \$1.65 per lb. and commercial casein, 66-67c per pound). Instead of dried egg yolk, 10% pollen

Table I. Comparison of pollen and pollen substitutes

Diet	Protein in the diet, Per cent	Number of Sealed Cells	Brood production index
Soy bean flour & dried brewers' yeast & dry skim milk & dried egg yolk (2½:1:1:1/2)	12.5	6236	1.0
Soybean flour & commercial casein & dried brewers' yeast & dried skim milk & dried egg yolk (1:1½:1:1:1/2)	21.2	10154	1.6
Pollen	12.7	9365	1.5

can be added by those who practice trapping pollen or rendering it from pollen combs.

The most convenient way of feeding pollen substitute to colonies outside is to offer it dry. Place the substitute in shallow trays (these can be made by cutting down the sides of corrugated paper boxes) and offer it to the bees in a sunny and protected place in the apiary.

A more economical method of feeding pollen substitute in the apiary is in the form of sugar candy. To make the sugar syrup dissolve two parts of granulated sugar in one part of hot water by volume. Thoroughly mix one quart of cold sugar syrup with one pound of dry pollen substitute by pouring the liquid into the substitute. However, this formula can be modified. With different brands of ingredients, you may need to use somewhat more or somewhat less sugar solution. The cake should be of such consistency that candy will stay on the top bars of the frames without running down.

The above mixture will provide about 3½ pounds of candy which consists of one pound of dry pollen substitute, about 1½ pounds of sugar and one pound (pint) of water.

To prevent drying, cover the candy with waxed paper and pat it down

so that it will adhere to the surface. Allow to stand overnight so that the liquid will penetrate the dry particles of food. It is then ready for use.

With a wide scraping knife or a hive tool, spread the candy over a piece of waxed paper in a layer about one-quarter to one-half inch thick. Open the hive, smoke away the bees, and place the cake directly over the cluster on the top bars of the hive so that the waxed paper is on top. Invert the inner cover of the hive to provide space for the candy.

Begin by giving about a pound of the candy to each colony. Repeat feeding every 7 to 10 days, increasing or decreasing the amount depending upon the amount consumed in the previous period.

Once started, the pollen substitute (either the candy or dry material) should always be available to the bees as long as natural pollen is lacking. Any interruption in the availability of the pollen substitute may cause a setback in brood rearing.

If the bees do not touch the candy substitute, change its consistency. If the bees still do not take the substitute, stop feeding. Maybe there is enough stored pollen in the hive. However, leave the cake in the hive for a couple of weeks; quite often the bees start taking it.

When using pollen substitute for

packages, do not give the cake at the time of installation. Wait about a week and then start feeding, placing the food directly over the brood nest.

In computing the amount of food necessary for the apiary, remember that candy made of one pound dry pollen substitute and one quart of 2:1 sugar solution will provide food for a single feeding of 3-4 colonies, depending on their strength. Estimate how many times you are going to feed your colonies (about 8-10 times if you start feeding in March). Multiply by this number the number of your colonies and divide by 3 - this will give you the approximate number of pounds of dry pollen substitute you have to prepare. Make only as much candy at a time as you need for a single feeding of your colonies. Unless placed in a freezer, the candy doesn't keep well in storage. The dry pollen substitute can keep more than a year if stored in tightly covered containers and if kept in a cool place free from insect infestation. If stored over a year, it is advisable, however, to admix fresh dried brewers' yeast in the proportion of 3 parts of old pollen substitute and one part of dried brewers' yeast.

The author would greatly appreciate it if beekeepers would report to him their results from feeding pollen substitutes.

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