

# **Developing an artificial diet for the honey bee *Apis mellifera***

## **Project Number- 03-GW-01**

**Project Leaders:** Dr. Gordon I Wardell, Collaborator USDA-ARS, Carl Hayden Bee Research Center, Tucson, AZ 85719 and Dr. Gloria DeGrandi-Hoffman, Research Leader, USDA-ARS, Carl Hayden Bee Research Center, Tucson, AZ 85719

## **Summary**

Last year, under Almond Board grant #02-GW-01, we developed a liquid protein diet for honeybees. The new formula successfully promoted brood production (young bees) at the same rate as colonies fed natural pollen (Table 1). While the prototype formula met our needs, its application was impractical because it was based on liquid components. A liquid product such as this would be far too costly for beekeepers to ship and store. In 2003, under grant 03-GW-01, we reformulated the diet to a dry powder base that could be mixed with sugar syrup at the beekeepers' point of application. The new formula demonstrated all the attributes needed in a honey bee protein supplement. In laboratory and field trials the product performed as good or better than natural pollen fed to the bees. A 2,000 pound test batch of the product has been produced and sent to beekeepers across the country to test in their colonies. A survey provided to the beekeepers will give information needed to determine how the product worked under diverse field conditions. We plan to review the survey results and reformulate the diet accordingly.

## **Objectives and Results:**

### **1. Reformulate the prototype diet with commercially available raw materials**

The initial diet we developed was a liquid base that worked very well but would have been too costly to ship and store. We were successful in developing an all dry formulation that is easy to formulate, mixes readily into sugar syrup, stays in suspension, and contains stabilizers to prevent spoilage.

### **2. Test the reformulated diet for brood rearing capabilities, honey bee viability and longevity at the Carl Hayden Bee Research Center, Tucson, AZ.**

Laboratory and field trials demonstrated that the bees successfully reared brood over an eight week period at the same rate as natural pollen. Viability of brood reared on the diet was not different from brood reared on natural pollen, meaning there was no significant loss of brood at any developmental stage. Observation colony and field studies of adult bee longevity showed that bees reared on the diet lived as long or longer than bees reared on natural pollen (tables 2 & 3). When adjusted for colony population size, colonies fed the liquid diet reared brood at a significantly higher rate than did colonies foraging for natural pollen (Table 4).

Table 1

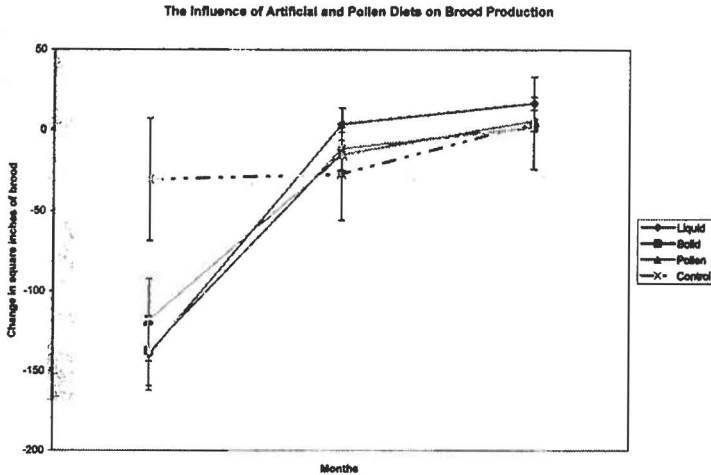


Table 2

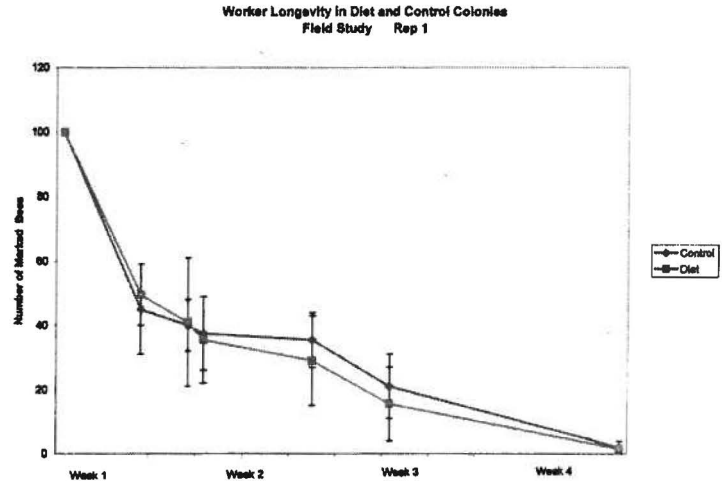


Table 3

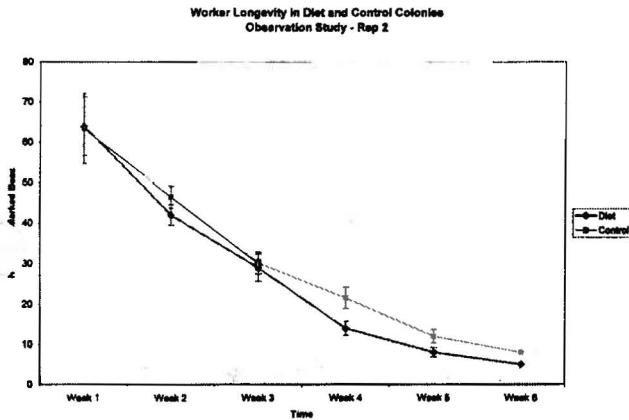
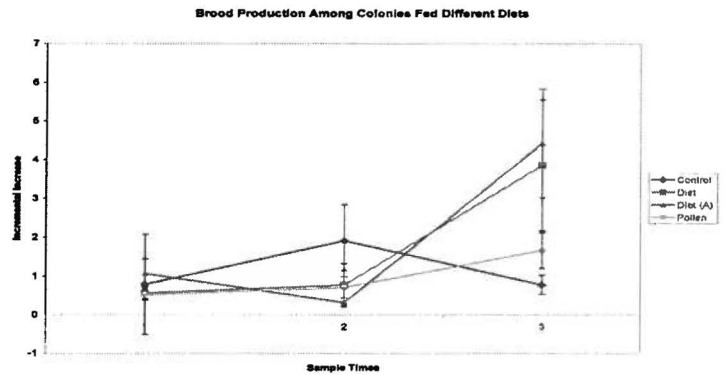


Table 4



**3. Ship a minimum of 25 Kg of product to each of twenty commercial beekeepers or researchers for field testing on full size colonies.**

In August 2003, a commercial manufacturer in Minnesota produced a 2,000 lb. test batch of the formula. The formula was shipped to twenty eight commercial beekeepers across the United States who enlisted as cooperators to test the new formula. These beekeepers will be testing the product in their local areas to determine how the supplement works under different climatic conditions. Most participants will be applying the supplement this fall while a few will be using the formula in Spring for early colony buildup.

**4. Develop an evaluation survey to be filled out by the growers to determine ease of use and efficacy of the product.**

A three page questionnaire was developed and sent to each participant. The survey's answers are set up in a manner that will allow numerical quantification and statistical analysis of the results. These analyses will provide crucial feedback to ease of use and efficacy of the diet.