

Raw Bee Pollen of Smart Agriculture center, NPUST

1. **Merchandise Name** : Raw Bee Pollen of Smart Agriculture center, NPUST

2. Developing Staff Members

單位 (系 / 所)	姓名	職稱
General research service center	Jui-Ching	Lecturer Rank
	Ker	Research Fellow
General research service center	Ming-Feng	Assistant Professor Rank
	Wang	Research Fellow
Department of Tropical Agriculture and International Cooperation	Kafle, Lekhnath	Associate Professor
General research service center	Jian-Liang	Lecturer Rank
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3. Development Idea

The tropical orchard is one of a sector inside the smart agricultural center at National Pingtung University of Science and Technology. It was established in 1992. The tropical orchard has been operated the breeding and researching on tropical emerging fruit trees for many years. In addition, there is also has an area for beekeeping practice under supervision of Associate professor Dr. Kafle, Lekhnath. Nearly 100 hives of honey bees have been managed without chemical usage. Many students from different countries have chance to learn and improve their skill about bee culture, breeding, management, and bee

products producing. Under the environmental management that is concerned for orchard ecosystem, many plant crops and weeds in this area can serve as sources of nectar and pollens for honey bees. At the same time, the presence of honey bees in orchard also elevates the plants pollination and increases yields.

This project aims to analyze the origin of pollens collected by the honey bees in this farm in order to know the types of plants and weeds in the tropical orchard that can be a safe food source for honey bees. Secondly, this project aims to develop and promote bee pollens as a high-quality organic product produced in smart agricultural center. Thirdly, we hope to promote the benefits of beekeeping in conjunction with organic farming. Lastly, we hope to promote and develop more bee products under the cooperation between smart agricultural center and honey bee farm in the future.

4. Technological Competition and Industrial

Application

Bee pollen drying : The moisture content of fresh pollen after collected by bee is about 15-20%, however, it is sometimes as high as 30-40%. Hence, Pollen must be dried as soon as possible to prevent moisture accumulation and deterioration. In order to ensure that the pollen can be preserved for a long time,

it generally dried until a moisture content less than 5%. This project, we used the hot air oven for drying pollens that is the most used method in commercial production. The drying temperature was controlled at 40-45°C for about 48 hours. Moreover, when the moisture content of newly collected pollen is high, In the early stage of drying, the air supply speed should be increased to speed up the drying effect to prevent the pollen becoming darker due to humidity and heat. The amount of pollen placed in each layer should not be too much, and the thickness should not exceed 1 cm.

Bee pollen sources analysis : The investigation on the pollen source plants, the traditional method by observing the honey bees' foraging behavior, the plants in the surrounding area that they visit and collect pollens, and then identify the plant species. The advantage behind this method is that we can record the bee foraging behaviors, plant growth environment, and flowering characteristics in details. Pollen microscopic examination: The pollen pellets on the honey bees' legs were removed and collected to identify plant species from their morphology observe under microscope.

Packaging design : With the change of consumer behaviors, there are many on the design of packages, and various food packages are gradually smaller. Small packages can not only control calorie intake, but also meet the diversified and personalized consumption needs of consumers. These also

bring a new development trend for food packaging equipment. In order to maintain the nutritional contents and flavor of bee pollens, keeping the pollen dry to avoid moisture resurgence, and avoiding the growth of bacteria and molds are important to considerations. Therefore, this project plans to reduce the packaging size and design a carry-on bag, which can be eaten in a single time as the starting point.

5. Merchandise Statement of Achievement

Crops pollination service : After the bee farm was set up by Associate professor Dr. Kafle Lekhnath of DTAIC, it was clear that honey bees were found on many different types of flowers in the area such as longan, lychee, corn, guava, lotus mist as shown in Figure 2. The fruiting rate and crop yields were significantly increased. The bee farms have made an important contribution to the surrounding environment and ecology. In addition, for the fruit crops which were grown in the greenhouse such as cantaloupe and pumpkin were also pollinated by honey bees from this farm by brought and placed the movable bee hives inside the greenhouse. This pollination service by bees could reduce the manpower and time spend for pollination by hand. It could also improve the quality of fruits and reduced the malformed of fruit which were caused by human poor pollination technique.

Teaching domestic and foreign student on beekeeping techniques : Associate professor Dr. Kafle, Lekhnath has been opened

the Apiculture courses, including both lecture and practice from fundamental to advance. Through the courses, students learned about the types, habits, and ecology of honey bees and the basic knowledge about beekeeping industry. Through the practical operation, students can acquire the basic skill on beekeeping management such as understanding the bee behaviors, beehives management, beekeeping tools, bee products, and learn how to maintain beehives.

Environment-friendly beekeeping: non-pesticide management has been applied to bee farm. The natural products such as probiotics and enzymes have been used to strengthen bee and brood health. The *Varroa* mites were control by oxalic acid and also under the research on applying the essential oils. The honey that harvested from farm has passed the quality standard for honey in Taiwan(CNS1305). Moreover, Honey was tested and reported to be free from 470 pesticides. The organic bee farm is not only safe for honey bees, but also for the beekeeper who work in that area. In addition, it is in line with the spirit of green university and sustainable development.

Bee pollen collection, drying, storage, packaging : A pollen trap is placed over the hive entrance and forces returning forager bees to crawl through small openings circular holes in order to enter the hive. The circular holes with a diameter of 4.8-5 mm are drilled in several rows on a sheet. The holes are small that some of the pollen pellets are stripped

from the bees' legs and fall into a drawer-like collection tray.

Raw pollens were dried in a hot air oven which are safe from small particle and insect contamination and can also the temperature and time. After remove the impurities in raw pollens, pollens were placed in a stainless-steel shallow container, and then dried at 40-45°C for about 48 hours or until the moisture decrease about 20%. After pollens were dried and removed small pollen particle by sieving (80-mesh sieve) , they were packed in a vacuum bag and stored in a 4°C. For the suitable packaging, the small sachet package is selected. This package can protect pollen from reabsorb of moisture and air. The amount of pollen in each pack is enough for 1 time consuming. It is easy to carry and store.

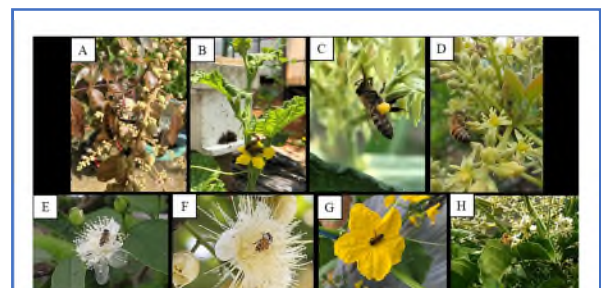


Fig 1 : Bees pollinate many flower at farm, A. Longan, B. Cantaloupe, C. Corn, D. Avocado, E. Guava, F. Wax apple, G. Pumpkin, H. Wampee.