Organic Honey of Thailand

Siriwat Wongsiri [1]
Chanpen Chanchoa [2]
Pichai Kongpitak [3]

Abstract

The organic honey in the kingdom of Thailand is new and innovation since few records in the literatures. Mostly the normal traditional beekeeping in Thailand is possible to be changed to the organic beekeeping in many bee-yards. The point we have to educate the beekeepers and verify the standard of organic honey in the Kingdom. The average annual honey production of a traditional hive is 3-5 kg/annum, while that of a box hive is 5-20 kg/annum. In areas with beekeeping potential, there are two or more harvests resulting from multiple flowering periods. In the country, about 10,000 metric tons of honey are produced annually . The types of honeys produced in Thailand are well known according to their seasons and their botanical origins. These types include *Eupatorium odortum, Dimcarpus fumatus, Hilianthus annus, Sesamum orientale*, and *Croton roxburghii* honeys. The majority of beekeepers extract honey by the traditional straining method, while some beekeepers with modern hives extract their honeys using honey extractors. This method has to be modified to be the standard or organic beekeeping methods. Now China produces organic honey from the Asian honey bee *Apis cerana* more than one million colonies in the forest. Bee flora and the beekeeping practice of Asian honey bees need not use pesticides and anti-biotics.

[1] Associate Fellow of the Academy of Science, The Royal Institute of Thailand
[2] Center of Excellence in Entomology: Bee Biology, Biodiversity of Insects and Mites, Department of Biology, Faculty of Science, Chulalongkorn University
[3] Department of Entomology, Faculty of Acgriculture Chiang Mai University

This year 2012 is the 80th anniversary of H.M. the Queen's Birthday (12th August). During this auspicious time, H.M.'s message for sustainable agriculture and conservation is that the forests are home of thousands of plant species, which need both "domesticated" and wild bees for pollination in order to produce organic honey and provide food for humans as well as thousands of wild animal species that inhabit the forests.

Keywords: Organic honey, Asian honey bees, bee flora

Introduction

Organic honey is a pure healthy honey from unpolluted virgin forests free from environmental pollutants.The organic honey in the kingdom of Thailand is new and innovation research is needed since there are no records in the literatures. Mostly the normal traditional beekeeping in Thailand is possible to be changed to the organic beekeeping in many bee-yards. It is necessary to educate the beekeepers and vertify the standard of organic honey in Thailand. The average annual honey production of a traditional hive is 3-5 kg/annum, while that of a box hive is 5-10 kg/annum. In areas with beekeeping potential, there are two or more harvests resulting from multiple flowering periods. In the country, about 10,000 metric tons of honey are produced annually (Wongsiri *et.al*, 2010). The types of honeys produced in Thailand are well known according to their seasons and their botanical origins. These types include *Dimocarpus fumitus* (Longan), *Eupatorium odortum*, and other wild plants honeys. The prices of these honeys vary from USD 5 to USD 10 per/kg. Longan honey is in especially high demand in the country and this kind of honey can be exported as the organic honey in the future. The majority of beekeepers extract honey by the modern beekeeping method, while some big company beekeepers with modern hives extract their honeys using machine honey extractors. This method has to be modified to be the standard or organic beekeeping methods. Now in China organic honey is produced from the Asian honey bee *Apis cerana* more than one million colonies in the forest. Bee flora and the beekeeping practice of Asian honey bees **need not use pesticides and anti-biotics.**

Biodiversity of Honey Bees in Thailand

A Black Dwarf Honeybee (*Apis andreniformis*) is the smallest wild bee which has the smallest comb in the world. This dwarf honeybee was first discovered in 1858 by Smith from collected samples from Sarawak, Borneo and the small southern tipped peninsular of Malaysia and was later found in Thailand in 1989. The black dwarf honeybee has similar morphological and biological characteristics as the red dwarf honeybee (*Apis florea*). The only distinctive difference is the reproductive organ of a drone. The discovery (by the Research Unit of Bee Biology, Chulalongkorn University) in this particular area helps clarify the distribution region of black dwarf honeybees and red dwarf honeybees in Thailand and Malaysia (Wongsiri *et al*,2000).

A Black dwarf honeybee's body size is slightly bigger than a housefly. Its abdomen contains clear black and white stripes. Northern villagers call them "Pung Maan". Black dwarf honeybees can normally be found in a forest near mountains or in gardens. They like to build their comb in a tree or a bush that is not too tall. There is only one level in the comb and the comb size is a little bigger than an adult's palm. Generally, a black dwarf honeybee's hive is covered with bushes and branches as a protection from intruders (approximately 20 cm.). During February and April, these honeybees generate the highest amount of honey. Therefore, this period of the year is considered to be a honeybee hunting season by the bee hunters and villagers (Wongsiri and Deowanich,2012).

A black dwarf honeybee is a rare species and the most difficult to find in Thailand. Moreover, this type of bee is neither found in Bangkok nor the metropolitan cities of Thailand. As a result, it is not possible to be commercial bees or to be kept for beekeeping purpose.

A Red Dwarf Honeybee (*Apis florea*) is bigger and has a bigger comb than a black dwarf honeybee but is smaller than an Eastern hive bee whose comb contains many layers. The red dwarf honeybee builds a single comb that is bigger than a black dwarf honeybee. Commonly, the comb is on the branch of a bush tree in a shady area to protect the comb from being directly exposed to the sunlight or the cold. A comb of a red dwarf honeybee, like a black dwarf honeybee's comb, is usually in a bush of thorns to be covered and protected from enemies and invaders. However, it is

discovered that some red dwarf honeybees build their hive on a tall building or under the eaves outside the house. Still, this particular case is very rare. Normally, the comb is approximately 1-15 m. above the ground. This wild red dwarf honeybee is the most common species to be hunted by the bee hunters. Moreover, their honey is sold everywhere in suburban markets of Thailand. Their honey combs are the most popular among honey consumers. Therefore, in the future, it is very likely that a red dwarf honeybee will become a well known commercial species as well as their honey to be certified as the organic honey.

In Bangkok, it is possible to find a red dwarf honeybee comb on a building or a tree such as a rain tree or yellow flame tree that is more than 15 m. tall. Combs of red dwarf honeybees and black dwarf honeybees are very similar. These two types of honeybees can be distinguished from each other through a slight difference in terms of morphology. A black dwarf honeybee has black and white color stripes while a red dwarf honeybee's stripes are yellow-orange and black. The first stripe of a black dwarf honeybee is black whereas a red dwarf honeybee's is yellow-orange. The other difference between the black dwarf honeybee and the red dwarf honey bee is the reproductive organ of the drone, the lines of the wing, and the tip of the back leg.

The distribution of a red dwarf honeybee covers the Southern area of China, the East of India, and South East Asia, which is an area located on a higher latitude than a black dwarf honeybee population. Currently, there is an evidence reporting that red dwarf honeybees distribution expands to Oman. Currently, the farmers in Oman keep them as the commercial bees (Peterson, 2011). Red dwarf honeybees can be found in all parts of Thailand except in the Southern region. Moreover, there are no red dwarf honeybees in Malaysia, Indonesia, and Philippines. Red dwarf honeybees are more flexible and adaptable in infertile areas than black dwarf honeybees. Therefore, red dwarf honeybees have more diversity and more places to build their combs than any other honeybees. One of the obvious examples is that red dwarf honeybees are the only species of honeybee that can survive in a region with heat that exceeds 40 degree Celsius. Red dwarf honeybees and black dwarf honeybees create a sticky band to cover branches and twigs that cover their comb as a protection from their enemies such as ants. This behavior does not occur in giant honeybees or any other honeybees.

A Common Giant Honeybee (*Apis dorsata*) is the biggest honeybee and has the largest comb as well. Its size is approximately 1.5-2 cm. A common giant honey bee has yellow and black stripe abdomen, strong wing, and can fly in high speed. They generally live in a forest or a suburb, building their hive on a tall tree, outside a house or a temple, a tall building, or under a high tank. Their comb contains only one layer with a big half circle shape (around 0.5-2 m.) and has no coverage unlike the two previously mentioned honeybees. A common giant honeybee is fierce and it can sting in a much painful manner than any other honeybees. Therefore, many people mistakenly recognize this giant honeybee as an Oriental hornet because their sizes are very similar. Many patients stung by a wasp usually mistakenly informed that they were stung by a bee. In fact, a bee can sting its target only once in its life and then it will die. People that are accidentally stung by a bee normally will not die. However, those people who intentionally hit or disturb the bee comb may be stung many times by several bees which might lead to death. Patients that are stung by wasps will have more severe condition than ones that are stung by bees since a wasp, unlike a bee, can sting numerous times. Therefore, there are always reports informing a patient died from being stung by wasps more than bees. April is the month that giant honeybees are most productive of generating honey. Consequently, there is a phrase saying "The Fifth month honey". This kind of honey is the most popular and expensive in Thailand and Malaysia. Nowadays, there is no need to hunt *A.dorsata* in the forest since they can be kept as domestic bees. Moreover, their honey can be produced annually, making it suitable for organic honey industry.

An Eastern Hive Bee (*Apis cerana*) is bigger than a dwarf honeybee but smaller than a giant honeybee with brown and yellow stripes abdomen. Eastern hive bees can build their comb inside a tree hollow or a building that is shut and dark. Their comb is a combination of many small combs in a parallel manner called "multiple combs", with 30 cm. diameter (Ruttner, 1988). This type of honeybee can be raised in an artificial hive or a trunk. They can store honey 20 g. per comb which is more than dwarf honeybees and giant honeybees. Generally, honey season of an eastern hive bee is the same as a blooming season of rambutan, durian, and coconut's flowers. Since this honey can be collected several times a year, Eastern hive Bee is the future of organic

bees in Asia including Thailand. However, like European or Western Honeybee, further research is required in order to make them more productive.

Eastern hive bees habitually left their comb for a new one, at least once a year. In China, eastern hive bees are parts of beekeeping industry as well as European honeybees. Since there is a breed selection procedure, Chinese eastern hive bees are able to generate as much honey as 25-30 kg. per comb and their comb leaving behavior is also reduced.

The correct process of natural comb collection is to cut only parts that contain honey without having to burn down the whole hive which would kill thousands of bees.

A Western/European honeybee (*Apis mellifera*) is larger than an eastern honeybee but smaller than a giant honeybee. This species of bee is imported from a foreign country; therefore, it is sometimes called a foreign bee or an Italian bee since beekeeping business is most prospered in Italy with an oldest history of Italian beekeeping. The beekeeping industry is dated back thousands of years during Roman Era (Crane, 1983, 1990 and Crane and Graham, 1985 Ruttner, 1988).

Western honeybees are local honeybees in Europe and Africa. They have similar characteristic as eastern hive bee which is the behavior of building multiple combs in a closed area such as a tree hollow, a stone corner, or a closed building. They were later used in beekeeping industry all over the world as their combs have the most appropriate size to be kept in a standard artificial hive. Moreover, western honeybees generate the most quantity of honey which is 50 kg. per comb. If the honey is collected several times, the quantity can be accumulated to as much as 100 kg. per comb annually. The other reasons that western honeybee is chosen is because this bee is not as aggressive as a giant honeybee and does not leave its comb as often as an eastern hive bee. In Northern Thailand, as many as 200,000 colonies are parts of beekeeping industry. European honeybee keeping can be developed into organic beekeeping if proper education is provided to all beekeepers. This includes teaching them the method know-how that conforms to organic honey standard.

Organic Honey and Other Products

Bees are categorized as "Industrial Insects" that provide numerous valuable economical products such as honey, beeswax, royal jelly, pollen, propolis, and bee's venom. These products can be divided into two categories;

1. Products derived from raw material that bees collect from outside their hive such as honey, propolis and bee pollen.
2. Products created by bees based on bee physiology such as beeswax, royal jelly and bee venom.

Organic Honey: Honey is derived from nectars of the wild flowers and economic fruit trees, flowers or other nectar sources such as honey dew that bees collect from aphids. This honey dew goes through chemical and physical process until it is transformed into honey stored inside a bee comb.

How do bees produce their organic honey?

After nectar that a bee collected from the flowers moves down to its stomach, the bee's salivary gland will produce enzyme for a metabolism process that converting glucose and fructose to invert sugar called laevulose, dextrose, and other types of sugar but only a little amount. This metabolism process begins from the bee flying back to its hive. While the bee is fanning, this would generate heat energy and activate enzyme activities as well as help burning and reducing moisture which accelerates the conversion of nectar to honey. When a bee worker arrives at its hive, it will spew the invert sugar from its mouth to another worker's mouth that work in the comb to be stored in honey cells. This invert sugar is not complete honey since it still has high level of moisture or water (30-40%). In the evening when most workers are already back to their hive, they will help one another fanning to make the nectar evaporate until it is transformed to complete honey which contains only 20-25% of water. After honey production process is finished, workers will use beeswax to close the honey cells in order to store the honey for later consumption to generate energy for the bee's daily life or during food shortage.

Organic honey is pure natural honey without any pesticide, antibiotic, and other contaminants. True organic honey is obtained from bee farms located long distance

away from agricultural areas. Therefore, this honey is clean from pesticides and chemical fertilizer. An example of organic honey is honey derived from white flowers or wild flowers such as Plao flowers. In future, the demand of organic honey in foreign countries would increase, since more people are seeking for pure natural honey.

Benefits of honey have been known and aware of since ancient times. Believing that honey could cure fatigue, Greek athletes would drink honey before any Olympic competitions. Egyptian doctors used honey to heal wounds from surgeries and sterilize germs before the discovery of bacteria. Through much more advance in technologies than in the past, the scientists found that honey's ability of bacteria anti-growing are due to its special attributes which are its low moisture and high osmotic pressure. These two attributes help osmosing water out of Microbial cell and making these germs die from water shortage. Due to these supporting reasons, the modern medicine accepts the usage of honey to heal some certain wounds especially wounds from surgeries and chronic ulcers of diabetic patients.

Different kinds of flowers that bees used to produce honey cause honey to have different scent and physical characteristics. Natural honey has a very sweet taste, pleasant aroma, and color that varies from light golden yellow to dark brown (depending on sources and types of plants). In Thailand, natural honey is obtained from hive bees, dwarf honeybees, and giant honeybees. In the past, Thai people mostly used honey as herbal medicine rather than eating as food. Nowadays, more people are aware of benefits from honey and also consume greater amount of honey; therefore, there is a significant increase in honey demand which leads to the origination of beekeeping industry.

Bees that are used in Thai beekeeping industry normally are Thai or Western hive bees. Honey derived from beekeeping business is exactly the same as the one that is collected in nature. Moreover, this honey can be specified which sources of flowers are required such as honey from longan, rambutan, or lychee flowers. In order to produce organic honey, bees are kept in an organic fruit orchard, using the organic beekeeping method. Unlike bees in the wild which have to find food themselves, domestic bees are carefully taken care of and therefore can produce more honey.

As prices of honey are rather expensive as compared to sugar prices, there is a production of artificial honey. This artificial honey is basically syrup added with artificial honey flavor and glucose syrup to make it stickier like real honey. The other way to make artificial honey is converting syrup to have components that are similar to actual honey then later adding honey flavor. Therefore, it is highly recommended that consumers make a careful decision and thoroughly seek for honey that has labels from standards of the Food and Drug Administration before purchasing honey. Genuine honey should have following characteristics; viscous (showing that there is little water), the fragrant of honey and natural flowers, no bubbles as a sign of rotting, no beeswax or bees contaminated, immaculate, and light yellow or dark brown color. People who are used to consuming honey can easily distinguish real honey from artificial one through smelling and tasting. However, for those without experience, it would be very difficult to do so without using chemical proof.

Apart from differences in flavor, smell, and colors, honey derived from different flowers also contains different composition of sugar such as having different ratio of glucose and fructose. Therefore, honey obtained from different sources generally has different characteristics such as color, scent, taste, or ability to crystallize. For example, honey from rubber farm and white flowers can all be crystallized after several hour frozen while honey from lychee flowers can be less crystallized or honey from longan flowers hardly crystallize at all under the same condition.

Honey is not only used in medical industry but is also used in making dessert, bread, candies, ice-cream, or mixed in beverage such as lemon juice. Besides providing delicious flavor, honey also contains high value of nutrition. Honey can be used as a replacement of sugar in any kinds of food. In addition, honey is currently one of essential ingredients in cosmetic industry such as soap, shampoo and cream.

Thai Industrial Standards Institute (TISI), Ministry of Industry has already launched standards for honey sold in Thailand. As an assurance that the consumed products are genuine, consumers should only purchase honey with labels of TISI trademark or buy honey from trustworthy sources.

Organic Bee Pollen: Based on botany, it is pollen from wild flowers or organic economic crops flowers and collected by bees. This bee pollen is generated through

a bee mixing with anthers and therefore the bee itself is carrying out the pollen grains. The bee uses its legs to gather these pollen grain into a pack to be stored in pollen baskets on its hind legs and carried back to its hive. Bee pollen is a nutrient with high protein for the whole bee population especially broods. The pollen that is incubated with honey until it is soft will be fed to brood worker older than three days. Although each bee pollens has different composition, all have protein as major component. Other components are fat, carbohydrate, enzyme, minerals, and all vitamins.

Beekeepers usually collect bee pollen from bee's hind legs and dry it under certain procedures that still maintain all nutrients. People normally consume by adding it into their coffee or make it as another kind of drink. Some companies make it into pellets called "bee pollen" as a valuable food supplement. These pellets can turn physical fatigue from work to be back to normal condition, especially digestive system because bee pollen can cause effect on bacteria and control bacteria in intestine.

Bee pollen is considered as one of the most nutritious food since it composes of natural organic compounds as followed.

Nutrition	Percentage
Carbohydrate	40%
Protein	35%
Amino Acid	15-25%
Water	18%
Fat	5%

Other minor components of honey are vitamin B, C, D, E, and potassium, magnesium, calcium, aluminum, iron, copper, zinc, phosphorus, and sulfur.

Benefits of Organic Bee Pollen, Biological activity of bee pollen is being very interested by scientific experts. Through animal sampling and clinical research, scientists are trying to find the effect of bee pollen to physical therapy, anti-aging, as well as sport and sex physical fitness. They discovered that bee pollen can accelerate tissue and skin growth, stimulate the blood flow through the whole body, and moisturize dry skin; therefore, it can provide an anti-aging therapy. In terms of medical

treatment, bee pollen is used to cure allergies by giving to patients in small amount then gradually increase the quantity as a way to help the body develop pollen immunity. In Europe, bee pollen is used to protect and relieve complications of flu. Moreover, bee pollen is also an ingredient of many cosmetics such as facial cleanser, foundation, and care skin cream. Bee pollen can also be used as hair nurture to remain sleek and glossy, and anti-dandruff through adding it into shampoo and pomade.

Organic Beeswax: In general, natural wax is categorized into three types; animal wax, plant wax, and mineral/petroleum wax. Beeswax is classified as animal wax. The pure beeswax can only be derived from a bee comb. Beeswax composes of several types of chemicals which are released from a beeswax gland located on a dorsal of bee's abdomen. Beeswax has a very interesting history beginning at the opening of the pyramid in Egypt. There was a discovery of beeswax at the place where Egyptian people stored their ancestor body. Beeswax was an ingredient used to make mummy. Moreover, the usage of wax candle in every religion has been recorded for thousands year. Especially in Suvarnabhumi Empire, wax candle had been lighted to worship gods and used as selling products since King Jayavarman VII (1181-1220). Today, there are still Candle Ceremony parades being organized every year before a Buddhist Lent period. Moreover, the King's Royal Chitralada Projects include not only Royal Honey Project but also Royal Wax Candle Project which transforms beeswax bought from beekeepers to royal wax candle used for all royal ceremonies.

At the beginning of the plastic usage, beeswax had been used as one ingredient for several years. During that time, the price of beeswax was considered very high. In fact, some regions even used beeswax as their currency. Regarding architecture aspect, beeswax is used to build sculptures and models, especially beeswax human figures in wax museum. In addition, sailors used to use beeswax for stuffing the water leakage on the ship or stemming food storage containers. Recently, beeswax has been used as insulation for electrical equipment and dentist tool.

Nowadays, beeswax is also used as cosmetic component such as facial cleanser, skin-care oil, lipstick. Moreover it is used in production of candles, glue, gum, crayons, and even ink. Benefits of beeswax as raw material of candles are; it releases little smoke and gives pleasant fragrant.

Marketing of Organic Honey

Generally, consumers will pay a much higher price for locally-produced honey of known origin than imported honey. The high price of locally-produced organic honey could be due to many factors. First, organic honey is a pure honey repeatedly cited in the Buddhist religion as a remedy for different human disorders, so honey is highly regarded in the culture. Its scarcity also makes supplies inadequate to satisfy local consumer demand, increasing its market value. Thirdly, locally-produced honey is heavily promoted for its medicinal and nutritional values, and consumers believe it to be the best honey. The high price of local organic honey has encouraged beekeepers to persist in their beekeeping practices and motivated many young people to engage in beekeeping as a part-time or full-time business. Above all, honey production and marketing assist in redistributing money from urban areas with high standards of living to rural areas with relatively low standards of living.

Currently the country imports annually more than 5,000 metric tons of table honey to fill the gaps in demand of 39,000 tons (CDSI 2010). The major source countries are Australia, China, Turkey, Mexico, Argentina, Pakistan, USA, Germany, and Yemen, listed in order of imported honey volume. Generally the prices of imported honey are much lower than the locally produced honey. However, neighboring Yemen supplies Thailand with the most desired imported honey, and local consumers are willing to pay up to USD 190 per kilogram (Shenouda 2004).

There is competition between locally-produced and imported honey, especially with honey imported from Turkey, Kashmir and Yemen. Some producers illegally sell the imported honey as local honey or mix the imported honey with local honey to sell at the higher prices of local honey. By this literatures if the beekeepers trust in organic honey, they can change their way to keep the bees with the organic beekeeping methods and make more money than the locally-produced and even sell the imported honey.

Royal Activity

Her Majesty Queen Sirikit has a strong will to improve Thai villagers' standard of living in a sustainable manner through hundreds of her royal initiative projects. One of such projects is beekeeping in the forest. Her Majesty stated that;

"Traditional beekeeping including wild bees and giant honey bees is part of our national heritage that requires urgent research and conservation. Burning bee nests in order to obtain honey does not only demolish bee populations but also lead to severe annual wild fire and forest destruction. Bees play a vital role in pollination of several plant species which are food sources and habitats of all wildlife. Therefore, without bees, there would be no fruits for human and animals, no flowers, no forests, and eventually no water resources such as rivers and creeks or upstreams. As a result, I believe that wild bees are the key components that help maintain our forests and world environment. Hence, applied traditional bee hunting (without burning the beehive) will preserve bee populations and sustain the right balance of our ecosystem."

Based on this belief, "Wild Bee Keeping on the High Mountain Project" was established under Her Majesty's patronage through collaboration between the Royal Thai Army and Royal Department of Forestry. The main goals of the project are to provide appropriate training for local bee hunters as well as educate them of conservative honey harvesting and the role of bees in forest ecosystem.

Organic Beekeeping (by Asian Apiculture Association 2010)

General Principle

Beekeeping is an important activity that contributes to the protection of the environment and agricultural and forestry production through the pollination action of bees.

Recommended Practices

- Hives should be made of natural materials that present no risk of contamination to the environment and bee products.

- Colonies may be fed with organic feed only to compensate for temporary forage shortages due to weather conditions or other exceptional circumstances.
- When bees are placed in wild areas, consideration should be given to their impact on the safety and integrity of indigenous insect population and pollination requirements of native plants.
- The treatment and management of hives should respect ACT organic livestock standards.
- The ability of bees to adapt to local conditions, their vitality and resistance to diseases should be taken into account.
- Honey temperatures should be maintained as low as possible during the extraction and the processing of bee products.
- Foraging areas should be large enough and as varied as possible to provide bees with sufficient forage and water.
- Bees should be kept healthy through preventive measures, selection of appropriate breeds, favorable environment, balanced diet and appropriate husbandry practices.
- The sources of forage should be essentially organically produced plants or naturally occurring vegetation.

Standards

General Management

1. Hives shall be placed in fields certified as organic and/or wild areas that have not been treated with substances prohibited in organic production. The location of hives shall ensure that bees have access to sufficient honeydew, nectar and pollen from plant sources which are in accordance with this standard. The operator shall notify ACT immediately of any changes of beekeeping sites.

2. The operator shall not site hives within foraging distances of sources of high-risk contamination and pollution, e.g. non-organic agricultural land exposed to practices with high environmental impact, densely populated urban areas, roads with heavy traffic, garbage dumps and incinerators.

3. At the end of the production season, hives shall be left with enough honey and pollen reserves for the colonies to survive the dormancy period. Any

supplementary feeding may be allowed only between the last honey harvest and the start of the next nectar or honeydew flow period. In such cases organic honey or sugar shall be used. (When organic sugar is not available, exceptions may be made for a specified time limit.) The operator shall record the type of feed, quantities, dates and the hives being fed.

4. Hives shall be made basically of natural materials. Use of materials that are potentially toxic or present risk of contaminating the environment and bee products is prohibited. Bee boxes shall be painted with only lead-free paints. Plastic foundation, if made with wooden frames and coated with organic beeswax, is permitted.

5. For cleaning and disinfecting beekeeping materials, buildings, utensils or products, permitted substances listed in Appendix may be used.

Conversion

6. Existing bee colonies may be converted to organic production. Introduced bees shall come from organic production units when available.

7. Bee products shall be sold as organic when beekeeping has been managed in accordance with this standard for at least one year.

8. All the wax shall be replaced with organic wax during this one-year period. Otherwise, ACT may extend the conversion period.

9. In cases where no prohibited substances have previously been used within the hive, the replacement of wax is not necessary.

Breeds and Breeding

10. The operator shall select breeds of bees that are able to adapt to local conditions and resistant to diseases.

Health care

11. The health of bees shall be primarily achieved by preventive measures and practices promoting resistance to diseases, e.g. replacement of queen bees at regular intervals, systemic inspection of hives to detect any health anomalies, control of male brood in the hives, regular disinfection of materials and equipment, destruction of contaminated hives and materials, replacement of beeswax, sufficient reserves of

pollen and honey in hives during the dormancy period, and use of beeswax not contaminated with diseases or pest.

12. Where preventive measures fail, and colonies become sick or infested, they shall be treated immediately. Treatments shall respect the following principles:

a. Preference should be given to the use of herbal medicinal products or alternative treatments provided that their therapeutic effect is effective for the condition for which the treatment is intended.

b. If necessary, allopathic chemically synthesized medicinal products (e.g. antibiotics) may be used under the responsibility of a veterinarian. In such cases the bee products shall not be sold as organic. The use of allopathic synthesized products for preventive treatments is prohibited.

c. All treatments with veterinary medicinal products shall be clearly recorded in details, i.e. the type of product, (including the indication of the active substances), the diagnosis, doses, the method of administration, the duration of treatment and the withdrawal period.

d. Treated hives shall be placed in isolation and go through a one year conversion period.

13. For disease and pest control the following are permitted:

- lactic, formic acid;
- oxalic, acetic acid;
- sulfur;
- natural essential oils, e.g. menthol, eucalyptol, camphor;
- Bacillus thuringiensis;
- steam, direct flame and caustic soda for hive disinfection.

14. The practice of destroying the male brood is permitted only to contain infestation with *Varroa jacobsoni*.

Mutilations

15. Mutilations such as clipping of the wings of queen bees are prohibited.

Harvesting and Processing

16. Destruction of bees in the combs as a method to harvest honey or other bee products is prohibited.

17. Extraction of honey from combs that contain brood is prohibited.

18. Chemical synthetic bee repellents shall not be used during honey extraction operations.

19. The use of smoke should be kept to the minimum. Smoking materials that are natural or in accordance with ACT organic standards are permitted.

20. In the handling/processing of bee products, the operator shall not:

- adulterate honey with water;
- use fine mesh filters or diatomaceous earth to separate seed crystals from honey;
- use high pressure filtration systems;
- heat or handle bee products using kerosene heaters or any heating systems which produce petroleum vapors in the room; or
- control stray bees or other insects using synthetic insecticides, repellants or fumigants.

21. All steps of extraction, processing and storage of honey or other bee products shall be handled with care and documented.

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