Office of Communications – November 2020

Good beekeeping practices for sustainable apiculture

Corrigendum

Updated on 13 December 2021

The following corrections were made to the PDF after it went to print.

Page	Location	Text in printed PDF	Text in corrected PDF
p.39	Environmental Inputs (text to be added after the 2nd paragraph)	... The richness of surrounding...	... With respect to the use of different types of chemicals as part of the agriculture practice, honeybees and other pollinators are not the target insects, but they are the recipients of all the direct and indirect effects of them. These types of chemicals/ pesticides include insecticides, acaricides, fungicides, herbicides and antibiotics and their effects on bees start from acute poisoning and instant death of adult bees and developing forms, to the chronic and fatal effects which are various and sometimes very unfavorable and difficult to quantify. Intensive agriculture practice usually requires higher quantities of pesticides to be used. However, in the last decades we see a tendency for reducing the total amounts of the chemicals used, still honeybee losses are increasing due to the use of the new families of more toxic insecticides (e.g. the neonicotinoids). The impact of pesticides on pollinators is vast, clear, and increasingly well documented. Honeybees' and other pollinators' decline, driven by pesticides, poses serious threats to the environment, ecosystems, and to human health. The richness of surrounding...
p.41	How to Optimize the Environment for Bees and Other Pollinators (text to be added at the end of the Chapter)	... From the other side, farmers need also to be aware and alert of the detrimental effects the pesticides and all the chemicals products used in the environment have on bees. The ministries of all countries must ensure that pesticides coming in to the market have no harmful effects on human health or animal health as well as no unacceptable effects on the environment. Beekeepers, farmers and other stakeholders together with policy makers should act responsibly to protect biodiversity, the quality of the environment and increase the level of protection for bees. That will be probably the only way to ensure food security for the future generations.	... From the other side, farmers need also to be aware and alert of the detrimental effects the pesticides and all the chemicals products used in the environment have on bees. The ministries of all countries must ensure that pesticides coming in to the market have no harmful effects on human health or animal health as well as no unacceptable effects on the environment. Beekeepers, farmers and other stakeholders together with policy makers should act responsibly to protect biodiversity, the quality of the environment and increase the level of protection for bees. That will be probably the only way to ensure food security for the future generations.
p.45	Right column, 2nd line	Fine-tuned regulation of pesticides in agriculture is therefore needed to protect pollinators from harmful chemicals that can decrease their overall fitness and inhibit the physiological development of structures that are vital to their behavioral ecology. Furthermore, to control pests such as the mite *Varroa destructor*, beekeepers often use miticides which contaminate the comb, and developing bees. For this reason, responsible use of medicines in bees is also paramount.	Fine-tuned regulation of pesticides in agriculture is therefore needed to protect pollinators from harmful chemicals that can decrease their overall fitness and inhibit the physiological development of structures that are vital to their behavioral ecology. Pesticide exposure can also be a risk to the quality and safety of bee products. Bee products testing carried out prior to sale to the consumer should include pesticides. Furthermore, to control pests such as the mite *Varroa destructor*, beekeepers often use miticides which contaminate the developing bees, and the bee products. For this reason, responsible use of medicines in bees is also paramount.
p. 48	Introduction	Supplemental food is necessary during periods when honey is harvested for human consumption. It is also needed in times of food scarcity due to environmental conditions or when splitting colonies to create new ones.	In a general way, it can be said that the feeding of a colony is necessary whenever it is devoid of feed or close to be. Supplemental feeding of bees may be necessary to assure appropriate stores for wintering. It is also needed in times of food scarcity due to environmental conditions or when splitting colonies to create new ones.

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p. 53	Sugar Feeding	Syrups are consumed by worker bees and stored in cells, similar to what they would do with incoming nectar. However, a drawback of syrups is that they can contaminate honey and drown the bees.	Syrups are consumed by worker bees and stored in cells, similar to what they would do with incoming nectar. However, a drawback of syrups is that they can contaminate honey and drown the bees. The use of Good Beekeeping Practices protects honey integrity and quality and the good reputation of honey globally. The product and amount fed, the time of feeding, the consumption of feed by bees, and the methodology to test honey will determine the probability of detection of foreign sugars in honey. Only products with a standardized composition should be used for bee feeding.
p. 53	How to feed: best practice	It is also important to protect hive products from adulteration by not feeding honeybees with syrup prior to a honey harvest. While it is not harmful to consumer health, it can be detected by modern equipment.	It is also important to protect hive products from adulteration by not feeding honeybees with syrup prior to a honey harvest or during a potential honey harvest. While it is not harmful to consumer health, very few quantities of sugar syrup (± 1 %) can be detected by modern equipment. Timing of feeding is essential and honey contamination risks need to be assessed by both time of year, nectar flow and hive strength. A risk assessment of supplemental feeding is always strongly advised (table 9).
p. 55	Pollen substitutes	… many of these companies have repurposed feeds from other animal feed markets (e.g. chicken liquid additives) with few or no adjustments for bee physiology. Moreover, some make extraordinary claims about their products' positive impact on colony health and development. Such claims should be not be taken at face value because few countries regulate what is fed to honeybees and few have been independently tested by scientists.	... many of these companies have repurposed feeds from other animal feed markets (e.g. chicken liquid additives) with few or no adjustments for bee physiology. Moreover, some make extraordinary claims about their products' positive impact on colony health and development. Such claims should not be taken at face value because few countries regulate what is fed to honeybees and few have been independently tested by scientists. Furthermore, some pollen substitutes may also be prepared with allergens, which must be declared on labels in many countries because they can cause severe allergic reactions and death. Honey testing should be carried out prior to sale to the consumer to ensure no contamination. Finally, the case of bee feeds containing ingredients from GMOs should be considered since they can constitute a source of contamination of the bee products where GMOs are forbidden.
p. 62	Veterinary medicines	Give treatments when needed and exercise the utmost care when choosing and using drugs for disease control, as most of these substances easily contaminate hive equipment and honey, create resistant pathogens and weaken the bees. Low-environmental-impact medicines should be the preferred choice. Mechanical/biological control may be the best first and second choice; certainly, it is the safest where contamination of hive products with medicines and risk to human health are concerned.Organic beekeeping methods rely on control methods that are beneficial to the bees (and effective against diseases), bee products and human health (they do not leave residues in hive products).	Give treatments when needed and exercise the utmost care when choosing and using drugs for disease control, as most of these substances easily contaminate hive equipment and honey, create resistant pathogens and weaken the bees. Low-environmental-impact medicines should be the preferred choice. Mechanical/biological control may be the best first and second choice; certainly, it is the safest where contamination of hive products with medicines and risk to human health are concerned. Organic beekeeping methods rely on control methods that are beneficial to the bees (and effective against diseases), bee products and human health (they do not leave residues in hive products). Appropriate testing should be carried out prior to sale of bee products to validate freedom of residues.
p. 78	8.1.3 The Eastern honeybee (Apis cerana)	Where honey is to be sold into export or international markets, particularly sound post-harvest handling is required to ensure good honey moisture content, which may naturally be higher than that of Apis mellifera."	Where honey is to be sold into export or international markets, particularly precautions should be taken that the product meets the requirements of international standards (Codex Standard, European Directive 2001, USP Honey Identity Standard) and all other quality specifications of the destination market.
p. 86	Title	Stingless bees	Stingless bee. Meliponini
p. 87	8.2.4 Stingless bees in Asia	Malaysia created the first National standard for a stingless bee honey in 1917.	Malaysia created the first National standard for a stingless bee honey in 2017 (Kelulut (Stingless bee) honey - Specification MS 2683:2017). The work of Nordin et al. (2018) was the base for the first norm of stingless bee honey "kelulut".
p. 90	8.2.6 Stingless bees in the Americas	*Tetragonisca angustula*, a species...	*Tetragonisca fiebrigi*, a species...
p. 91	Figure 71		New artwork of Fig. 71, to make it easier to read it.

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p. 99	9.1.2 Honey management steps. Harvesting.	Although both needs are linked to commercially relevant qualitative components, obtaining unifloral honey at the required purity levels and synchronizing the harvest of the honeycombs with flowering times can involve compromises on the levels of maturity, including water content to the extent possible, only completely ripe honey should be harvested, corresponding to combs with more than 75 percent of the honey cells sealed.	Although both needs are linked to commercially relevant qualitative components, obtaining unifloral honey at the required purity levels should not compromise honey maturity. Only completely ripe honey should be harvested, corresponding to combs with more than 75 percent of the honey cells sealed.
p. 99	9.1 HONEY 9.1.1 Introduction	This section presents provides a step-by-step explanation of honey management, from harvesting the raw material produced by the bees, to food safety and preserving its nutritional value and quality in the best possible way. More specifically, this chapter covers harvesting, separation/ extraction, purification, drying, crystallization, melting/ pasteurization, storage/ripening, ultrafiltration, and packaging/ placing on the market. It also discusses minimum quality and hygienic requirements of honey for international legislation, strategies to support the sector and new perspectives. Throughout the process, beekeepers should aim to pre- serve the main characteristics of the product that reflect the bees' activity and their territories.	This section presents a step-by-step explanation of honey management, from harvesting the raw material produced by the bees, to food safety and preserving its nutritional value and quality in the best possible way. In a sustainable development frame, only the techniques that can really arrive at this level of quality (at least required by the CODEX rules) should be presented. More specifically, this chapter covers harvesting, separation/ extraction, filtration, drying, crystallization, melting, storage and packaging/ placing on the market. Industrial techniques like drying, melting, pasteurization, ultrafiltration are mainly intended to improve the presentation of honeys, (e.g. when the crystallization does not meet consumer expectations) or to reintegrate into the commercial circuit a product that does not meet international legal limits, such as unripe or degraded honeys. It should be noted that these are not good beekeeping practices, even if they are commonly used in some countries.
p. 99	9.1.2 Honey management steps. Harvesting.	In warm and humid climates, even sealed cells can contain honey with more than 24 percent, even 28 percent, moisture content.	In warm and humid climates, even sealed cells from *Apis mellifera* may contain honey with more than 18 percent moisture. Moisture content of capped honey cells from other Apis species may be even higher in those cases.
p. 99	Separation/extraction	For "chunk honey" production, the operator only needs to select and to cut the honeycombs to the desired size. However, if the honey is to be separated from the honeycombs, the capping of the cells is removed mechanically with a hot rod, scraper or knife before proceeding with the extraction by draining or centrifugation. Regarding traditional honey separation techniques, pressing is still used.	For "chunk honey" production, the operator only needs to select and cut the honeycombs to the desired size. However, if the honey is to be separated from the honeycombs, the capping of the cells must be removed (delete "mechanically") with a hot rod, scraper or knife before proceeding with the extraction by draining or centrifugation. Regarding traditional honey separation techniques, pressing is still used.
p. 99	9.1.1. Introduction	More specifically, this chapter covers harvesting, separation/extraction, purification, drying, crystallization, melting	More specifically, this chapter covers harvesting, separation/extraction, decantation, drying, crystallization, melting
p. 99	Purification	Purification Honey is generally purified by straining or decantation. To strain the honey, it is heated to 30–35 °C, filtered through one or a badge of strainer(s) (mesh size 0.3–1 mm) or a tubular sieve (0.4–0.5 mm) in liquid form, and put on the honey ripener, so that wax particles and foreign matter (e.g. bee fragments, small pieces of propolis, wood splin- ters) are removed. Decantation consists of leaving the honey in a suitably large container, maintained at about 25 °C, so that air bubbles and impurities can separate according to their specific weight; wax particles, insect pieces and other organic debris float to the surface while mineral and metallic particles drop to the bottom. Settling velocity varies with particle size (the smallest settle the slowest), container size and honey viscosity; at tempera¬tures of 25–30 °C it is generally rather quick and can be completed in a few days. The purification step should be steered by the same three main objectives as for the extraction step.	Decantation Honey is generally purified by straining or decantation. The speed of this process depends on the humidity of honey and on the temperature of the room. Honey can be strained through one or a badge of strainer(s) (mesh size 0.3–1 mm) or a tubular sieve (0.4– 0.5 mm) in liquid form, and put on the honey settling tank, so that wax particles and foreign matter (e.g. bee fragments, small pieces of propolis, wood splin- ters) are separated. Decantation consists of leaving the honey in a suitably large container, maintained at about 25 °C, so that air bubbles and impurities can separate according to their specific weight; wax particles, insect pieces and other organic debris float to the surface while mineral and metallic particles drop to the bottom. Settling velocity varies with particle size (the smallest settle the slowest), container size and honey viscosity; at tempera¬tures of 25–30 °C it is generally rather quick and can be completed in a few days. The decantation step should be steered by the same three main objectives as for the extraction step.

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p. 100	Drying	According to the Codex Alimentarius Standard for Honey, honey must be ripe and have a moisture content under 20 percent. For good preservation, honey humidity must be under 18 percent. However, as mentioned earlier, in exceptional cases, it is not possible to fulfil these requirements and the moisture content must be reduced.	According to the Codex Alimentarius Standard for Honey, honey must be ripe and have a moisture content under 20 percent. For good preservation, however, honey humidity must be under 18 percent. In exceptional cases, and in order to prevent fermentation, the moisture content of honey still in the combs could be reduced in a couple of points only through internationally accepted methods.
p. 100	Drying	This can be achieved before the honey is extracted from the combs, or afterwards when the honey is a bulk liquid. By exposing honey to different temperatures, pressures and relative humidity, water can be evaporated and the moisture content lowered by a few percentage points.	This can be achieved before the honey is extracted from the combs. By exposing honey combs to low ambient relative humidity, the moisture content of honey can be reduced in a couple percentage points.
p. 101	Melting/ pasteurization	Honey is very sensitive to temperatures above 40 °C, and should only be exposed to such conditions in very specific cases. Time and temperature are directly related to the destruction of honey enzymes such as diastase. Honey is melted to eliminate the organoleptic and preservation disadvantages following excessive or inhomogeneous crystallization. It is done by heating the honey, which irreversibly melts the crystals. Honey is also exposed to high temperatures for controlled periods of time to pasteurize it. This technique is forbidden in some countries due to its degradation of enzymes. Honey is pasteurized to prevent unwanted fermentation by osmophil- ic yeasts (particularly when the process does not guarantee a moisture content lower than 0.60) and/or delay crystalli- zation (up to nine to ten months). It is not recommended. It consists of exposing the honey to 77 °C for 2 minutes, 60 °C for 30 minutes, or 71 °C for 1 minute, and then rapidly cool- ing it to 54 °C (e.g. with plate heat exchangers). The melting/pasteurization step should be steered by the same three main objectives as for theextraction, purification and drying steps.	Honey is very sensitive to temperatures above 40 °C, and should only be exposed to such conditions in very specific cases. Time and temperature are directly related to the destruction of honey enzymes such as is shown by the increase in HMF, which is formed from hexoses like fructose, and the destruction of honey enzymes such as diastase and invertase. When beekeepers are confronted with cristals in their honey during the harvest, honey can be melted to reduce the excessive or inhomogeneous crystallization. It is done by heating the honey at a the most lower temperature needed and during the shortest period possible. Officially honey can only be pasteurized by industry to prevent unwanted fermentation by osmophilic yeasts. Pasteurization is an industrial process that does not fulfill the requirements of a good beekeeping practice guide. The melting/pasteurization step should be steered by the same three main objectives as for the extraction, decantation and drying steps.
p. 101	Storage/ripening	**Storage/ripening** … Honey should be stored at a temperature below 20 °C, and 14°C for creamed honey or unstable honeys. The storage/ripening step should be steered by the...	**Storage** ... Honey should be stored at a temperature below 20 °C, and 14°C for creamed honey or unstable honeys. Honey is hygroscopic and must always be kept in close containers for storage and in a dark room. The storage step should be steered by the...
p. 101	Ultrafiltration	**Ultrafiltration** Ultrafiltration is an industrial process never used by single beekeepers. It is carried out by first heating the honey to about 60 °C, at which it is totally liquefied, and then filter- ing it through ceramic or diatomaceous filters, the mesh of which is less than 50 µ. The result of this operation is the removal of almost all extraneous solids and pollen grains. The disadvantage of this process is that it becomes impossible to determine the floral origin, and consequently the geographical origin, of such filtered honey without the pollen grains. Another risk is that the HMF level may exceed the upper limit of 40 mg/kg fixed by Council Directive 2001/110/EC. Consequently, according to the European Commission (2002), high-quality honey should never be ultrafiltered. In EU, ultrafiltered honey must be labelled to inform the consumer of its low quality. The ultrafiltration step should be steered by the follow- ing main objectives: • removal of all undesirable substances and agents. • minimization of contamination from biological agents, foreign bodies and substances in solidform.	**Ultrafiltration** The industrial operation of ultrafiltration deeply denatures honey and is not in line with good beekeeping practices. The so called “ultra- filtered honey” is not considered pure honey.” In the EU Honey Directive, these honeys must be specifically labeled to inform the consumers.

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p. 102	9.1.3 Minimum quality and hygienic requirements for honey in international legislation	However, that definition of honey is not universal. For example, the Chinese definition is much broader: it is a “sufficiently brewed naturally sweet substance” made when “bees collect nectar, honeydew secretions or plants, mixed with their own secretions.	The Chinese standard does not comply with the CODEX standard as the Chinese definition of honey is much broader: it is a “sufficiently brewed naturally sweet substance” made when “bees collect nectar, honeydew secretions or plants, mixed with their own secretions”.
p. 103	Composition and quality requirements	Composition and quality requirements Honey composition, specification and related methods are clearly defined in international standards such as the Codex Alimentarius, European Union, the International Organization for Standardization (ISO), DeutschesInstitutfürNormung (DIN) and guidelines of different trade and beekeeping associations.”	Composition and quality requirements are clearly defined in international standards such as the Codex Alimentarius, The European Directive, the International Organization for Standardization (ISO), the USP Identity Standard for Honey, the Deutsches Institut für Normung (DIN) and guidelines of different trade and beekeeping associations. (U.S. Pharmacopeia Identity Standard, 2021. Available at: https://www.foodchemicalscodex.org/fcc-forum)
p. 103	Composition and quality requirements	The Chinese composition criteria focus only on “fructose and glucose content” (≥60 g/100 g) and “sucrose content” (≤5 in honey not listed; ≤10 in eucalyptus honey, citrus honey, alfalfa honey, lychee honey and wild Osmanthus honey), with values more or less identical to the Codex Alimentarius / European Union standard, but with the addition of a limit for zinc (≤25 mg/kg) (People’s Republic of China, 2011).”	While CODEX is the only internationally accepted standard, tThe Chinese composition criteria focus only on “fructose and glucose content” (≥60 g/100 g) and “sucrose content” (≤5 in honey not listed; ≤10 in eucalyptus honey, citrus honey, alfalfa honey, lychee honey and wild Osmanthus honey), with values more or less identical to the Codex Alimentarius / European Union standard, but with the addition of a limit for zinc (≤25 mg/kg) (People’s Republic of China, 2011).
p. 212	In references	Brosi, B.J., Armsworth, P.R. & Daily, G.C. 2008. Optimal design of agricultural landscapes for pollination services. Conservation Letters, 1(1): 27–36. https://doi.org/10.1111/ j.1755-263X.2008.00004.x Büchler, R. & Uzunov, A. 2017. Honey bee selection. In P. Kozmus, B. Noc & K. Vrtacnik, eds. No bees, no life, bee¬books zaloznistvo in promocija.	Brosi, B.J., Armsworth, P.R. & Daily, G.C. 2008. Optimal design of agricultural landscapes for pollination services. Conservation Letters, 1(1): 27–36. https://doi.org/10.1111/ j.1755-263X.2008.00004.x Buawangpong, N. and M. Burgett, 2019. Capped Honey Moisture Content from Four Honey Bee Species: Apisdorsata F., Apis florea F., Apis cerana F, and Apis mellifera L. (Hymenoptera: Apidae) in Northern Thailand. Journal of Apiculture 34: 157-160 Büchler, R. & Uzunov, A. 2017. Honey bee selection. In P. Kozmus, B. Noc & K. Vrtacnik, eds. No bees, no life, bee¬books zaloznistvo in promocija.

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