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Black Sea CROSS BORDER COOPERATION

BEEKEEPING GOOD PRACTICE GUIDE

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CHAPTER 1 FOREWORD

This guide is part of the "Increasing trading and modernization of beekeeping and connected sectors in the Black Sea Basin" ITM BEE-BSB project.
This guide is intended for beekeepers and aims to support them with the necessary information to carry out, in the best possible conditions, the production process, conditioning, bottling and capitalization of bee products as a self-monitoring tool to identify the risks of contamination that may occur in the process of production and marketing of honey and other bee products.
All apiarian products obtained by beekeepers must meet quality standards in accordance with the European Union legislation and the entire production process up to marketing should be tracked in such a way as to identify the origin of problems in terms of their quality in the chain of distribution up to the consumer.
Beekeepers must assure their customers that the beekeeping products offered comply with European Union quality standards.
This guide is addressed to beekeepers who produce, condition and distribute their own production, not to beekeepers who buy, condition and market honey to other beekeepers.
This guide was based on:

- the information acquired during the implementation of the project "Increasing trading and modernization of beekeeping and connected sectors in the Black Sea Basin" on the occasion of the project activities in the partner countries (Romania, Bulgaria, Turkey, Moldova and Ukraine),
- specialized scientific papers existing in the partner countries participating in the project, information from the websites of some institutions with reference to beekeeping / beekeeping products / agriculture.

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CHAPTER 2 – TECHNOLOGIES USED IN APICULTURE

2.1. APIARY FOR PRODUCTION

The production apiary is the apiary specialized in obtaining one or more bee products.
In order to capitalize on the productive potential of bee families and to ensure their optimal development during the main harvests, it is necessary to carry out specific works during the year.
The preparation for the production season starts at the end of the previous summer (July-August), the period when the beekeeping year begins, i.e. the period when the bee is prepared for hibernation taking into account that the development in the next spring and therefore the next production season depends on that stage.

Upkeeping works for the bee colonies in a beekeeping year[1]

In a beekeeping year, several specific periods stand out that beekeepers must take into account during their exploitation activity of apiaries. These periods are approximated in terms of calendar month intervals, with fluctuations mainly depending on the climate (specific to each partner country in the project) and the strength of bee families at the time.

A. The bee breeding period prior to wintering

During this period, the growth of generations of bees occur by developing a fat body, ready to last several months during the cold season and to resume in the spring the development cycle of the bee family.
The success of the actual wintering of the bee colonies, the optimal development in spring and the capitalization of the harvests in the following season depend on this period.

By carrying out these works, the bee family should have at the beginning of winter:
- 1.5 -2 kg of bees (occupying on average 6-7 ranges of Dadant frames and 7-8 ME frames)
- 15-20 kg of good quality honey in honeycombs,
- minimum 0.5 kg of bee bread supply.

Necessary measures:

1. providing good quality queens (replacing queens, especially those more than two years older);
2. preparation of food reserves in terms of quantity and quality. Only the excess honey will be collected, so that enough supplies are left for the winter. **In the vertical hive maintenance system**, the honey is harvested from shops / production bodies and the required amount of honey is left in the base body (nest) for wintering.

!! Leaving manna honey supplies should be avoided, which, due to its high content of salts and other minerals, increases the amount of excrement that accumulates in the bees' rectum during the winter,

[1] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 6-10, 2011

producing diarrhea and Nosema. The replacement of this honey, if it results from the last harvest, must begin with the end of July and end in the first decade of August.

3. **applying complementary feeding** when there are not enough food reserves (in the late summer months)
   - in case natural pollen is missing or when there are no bee bread supplies, protein cakes are to be administered for the appropriate development of the fat body in wintering bees.
   - when time allows it, depending on the existing food in nature as well, a series of stimulation feeds can be performed (0.5-1 kg of syrup / bee family / week) so that the queen continues to lay eggs and obtain a as many hibernation bees as possible to be able to survive the winter.
   - it is good to ensure, if possible, both natural nectar and pollen harvests in order to reduce the consumption of reserves and ensure the normal development of the bee family and the preparation for winter.
4. **ensuring a proportionate, well organized nest**, provided with well-formed crowns of honey, quality honeycombs (not older than 3 years) for wintering, because this better keeps the heat in the nest. It should be considered that the clump is to be formed in the lower part of the body, whereas above and on the side, enough honey supply should be available, usually on one side of the hive.
5. **unifying weaker bee families** or helping some with supplies from healthy colonies.
6. **ensuring the necessary warmth in the nest** (when generally, the temperature at night decreases) by tightening the nest on the honeycombs with a population of bees and the related food.
7. **Early treatment of varroosis** (*Varrooa destructor*) according to authorized treatment methods.

B. The wintering period

This period includes the winter rest interval (October / November - January / February) and also the period of replacing the winter bees and the development bees in spring; the winter period (the period of time starting with the formation of the winter cluster up to the general revision in spring) presents at the level of the entire Region of the Black Sea Basin, due to climatic characteristics, certain differences expressed by the time of onset and duration.

During this period, the beekeeper must take into account the following aspects:
- overcoming the winter conditions in the best possible conditions, with an acceptable mortality, located within normal limits, both at the apiary level (0-10%) and at the family level,
- the replacement of the winter bee and a good early development in spring in order to capitalize on the first harvests, especially the acacia harvest.

Necessary measures:
1. **tightening the nest** on the required frames and supplies by means of diaphragm. Restricting the nest exclusively on the frames occupied by the winter cluster ensures the rapid growth of the population in spring.
2. **packing (insulation) of the nest** and ensuring a good ventilation**.**
3. **choosing a sunny hearth**, with no strong currents or winds is very important for the bees to winter, and the positioning of the hive is made so as to capture maximum solar heat.
4. **ensuring the silence in the apiary** by preventing the noise produced by birds, animals, tremors

caused by means of transport, etc.

5. **facilitating the performance of cleaning flights** on hot days - over 12 degrees C, for the elimination of the feces contents and preventing diseases having diarrhea as a symptom.
6. **the apiary hearth will be cleaned** in case of heavy snowfalls; the flight decks will also be cleaned in order to avoid the formation of ice on the bee entrance and, implicitly, the obstruction of the ventilation.
7. **winter check -** by the check list (placed on the bottom of the hive) and by auditory control with the help of a rubber tube (listening to the specific hum that gives clues about their condition).
8. **administration of energy cake frames** in case of food insufficiency.

The administration of energy-protein cakes, which stimulate the development of the bee family can be made towards the end of February, only after they have made a cleaning flight and when there is a possibility that the flight will be repeated in 2-3 weeks.

9. **Mortality assessment** is performed on the first check in the spring, when the following aspects are usually noted:

a. The size of the bee family (bee ranges),
b. The presence of the queen and her egg mass,
c. Brood surface,
d. Food reserves,
e. The number of dead bees on the bottom of the hive,
f. Any signs of disease present.

The causes of excessive mortality are established by submitting samples to authorized laboratories! Some mortality can also be assessed by the beekeeper: such as when bees starve - bees die with their heads inside the cell and as a characteristic of the species, in the absence of food, all bees die at about the same time.

Starting with March, the beekeeper must make several checks on the condition of the bees through (1) the spring summary review and (2) the general review.

The spring summary review is aimed at checking the condition of the colonies at the end of winter and adjusting abnormal situations that can endanger the life of the bee family.
This check is carried out on a sunny day in March, which allows the opening of the hive, the assessment of the power of the bee family, the presence of the queen depending on the presence of the captive and non-capped brood, the assessment of food reserves and their placement, but also the assessment of bees health according to the general appearance of the combs (quality of laying eggs, spots of diarrhea) and of the remains on the bottom of the hive.

The general review is a general spring check on the same objectives as the summary review, but it aims at a more thorough inspection to create the conditions for the development of the bee family.

C. The period of bee family development and natural breeding as well as the capitalization of the main harvests in the warmer period of the active beekeeping season

During this period, a series of very important works are to be carried out leading to the preparation of bee families for the capitalization of sustenance harvests (early spring) but also of production harvests.

The steps taken during this period aim at:

- breeding an appropriate amount of brood so as to ensure the harvester bee population necessary for harvest capitalization,
- maintaining the bee families active to harvest the existing nectar,
- ensuring the necessary space for honey storage,
- limiting the loss of bees as a consequence of natural swarming,
- the swarm breeding by artificial swarming.

Necessary measures:

1. **organizing and tightening the nest** in such a way that only the honeycombs covered with bees remain, after which the packing is restored. The nest is organized as follows: a honeycomb with supplies, honeycombs with brood and another honeycomb with supplies (honey and bee bread) so that all the honeycombs are well covered with bees.
2. **widening the nest**, when the weather becomes favorable, by periodically introducing (every 7 days) good laying combs. Initially, they will be placed on the side of the brood nest, after the last brood honeycomb, but as the weather becomes more favorable, they are introduced right in the middle of the nest (breaking the nest). Doing so and starting from 2-3 queen cells, about the number existing in a family of medium-sized bees (1.5 kg bees) in the last decade of March, one can reach in mid-April, depending on the climate conditions, up to 7-8 honeycombs with captive brood, of which a large part will hatch at the end of the month, and by the time of acacia blooming, there will be a sufficient number of bees to capitalize on the harvest. One of the disadvantages of this method is sometimes the appearance of swarming fever even during the acacia harvest. Therefore, in parallel, a series of appropriate measures can be taken to maintain the bee families at the strength necessary to capitalize on the harvests, but also to reduce as much as possible their loss by swarming.

The period of natural breeding

In the conditions specific to Romania, June is the period when the bee family reaches its maximum development, which coincides with the linden flowers harvest.

During this period, bee families usually enter the swarming fever, the phenomenon being related to the process of natural reproduction and the instinct of perpetuation of the bee family. This condition is characterized by the slowing down of the activity of collecting bees, the appearance of swarming queen cells and the swarming queens, but also the presence of a large number of bees in the bee entrance in the form of clusters (beards), followed by the departure of a part of the bees with the queen (swarming).

There are situations when the bee family swarms once or several times, i.e. the primary swarms when the bees leave with the old queen, and secondary swarms when from a family of bees, after the departure of the primary swarm, the family swarms again.

The causes are various and are described extensively in the literature. The beekeeper can limit or prevent their occurrence through a series of measures related to:

- maintaining the continuous harvesting activity,

- ensuring the laying space - ensuring the supply space, - sufficient ventilation.
- replacement of the queen in the swarming bee family

In general, the success of these measures depends on the stage reached, so that it is a relatively effective measure to raise part of the bee surplus and create an artificial swarm or the division of the bee family can simply be resorted to.
The capitalization of the main harvests aims at obtaining maximum productions, from as many honey resources as possible, with minimum costs. Most often it is a matter of pastoral transport for the capitalization of nectar harvests (production harvests), but also for the pollination of some entomophilous grown plant species based on pollination contracts with farmers.

The beekeeper must ensure the following:

- rich honey resources within the optimal flight range - within a radius of 3 km. It is important to be well informed regarding: the floral masses, the prognosis of the flowering period, their honey capacity, the possibilities of obtaining good access hearths, the traveling distance, etc.
- sufficient production equipment in good condition: hive bodies, stores, honeycomb frames, artificial honeycombs, etc.
- machines and other equipment needed to transport the hives.
- equipment and machinery necessary for honeycomb harvesting and honey extraction.

The efficiency in the practice of pastoral beekeeping depends on several factors, the most often invoked being related to the distance from the hearths, the number of bee families, the existence of related equipment, but also the optimization of investments in relation to the profit obtained.

2.2. PRODUCTION APIARIES FOR BIOLOGICAL MATERIAL

Beehives for the production of organic material are specialized apiaries for the production of any biological material from the bee family that can be used for reproduction and selection, for beekeeping activities or for marketing.
Regardless of the queen production apiary – be it either elite or multiplication apiaries, queen production is achieved by directed growth, under natural conditions, during the active season.

In principle, the quality of the queen (its prolificacy) is determined by its origin (genetic factors, degree of improvement), the quality of mating, but also by the way it was raised, and an optimal growth implies optimal conditions during the development of queen larvae and pupae.

A. QUEEN BREEDING[2]

A.1. Essential elements in queen breeding:

- **The biological breeding material** – The development stages of the brood yielding the queens:
    - Queens with perfect specific characteristics can be raised from eggs and larvae up to three days old - bipotent phase (sensitive phase).
    - From the 4-day-old larva, most grown queens will have intermediate characteristics between queens and workers (critical phase).
    - Larvae over 4 days can no longer serve as biological growth material because they only come out as working bees (fixed phase).
- **The optimal age of larvae** of 1,5 – 2 days of larval stage has a great importance in the practice, influencing the development of the main internal organs in the queens: ovaries – number of ovarioles, the size of the spermatheca, development of the mandibular gland.
- **The power of the nurse family and its disposition for raising queens** - the nurse family should be as crowded as possible with bees with a large number of nurse bees, which leads to the acceptance of a large number of larvae and their supply with a sufficient amount of milk.
- **Food supply**. The nursing family must be provided with sufficient reserves of food - honey and pollen (bee bread).
- **Additional feeding** with syrup, especially if there is no natural harvest, then it is mandatory.
- **The brood comb size in breeding acceptance**. The size of the natural queen cells is 7,8 – 8,5 mm in diameter and 8-10 mm in length, according to the breeding or breed conditions, but in practice the 9 mm diameter is used because queen cells of the size of natural ones come out.
- **The volume of the growth series (number of queen cells/ starter family).** For our indigenous bees, about 30 queen cells / family are recommended if there is also uncapped brood, especially if the starter family continues to nurse throughout the larval period, but if there are not, 50-60 queen cells can be recommended. The choice depends on the breeders and their breeding experience.
- **Number of series**. Depending on the breeding method: e.g., in a single good nursing family, without a queen, 3 successive growth series can be ensured without further back-up, every 5 days. When the nursing family is used only as a starter family (larval acceptance) and the growth frame is replaced every 2 days, the number of batches can be doubled without problems. A family without a queen can be a permanent starter family if a captive, hatching brood is added on a weekly basis to replace the losses.

A.2. Breeding method

Breeding queen bees starting from the egg or the worker larval stage to the ready-to-hatch cell phase represents an unitary biological process. Any method that is used will give good results if the raising

[2] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 11-14, 2011

conditions are observed, the way the growth material was handled and the growth was prepared, so that their potential is not overburdened.
When choosing the method of breeding, the necessary queens must be taken into account in conjunction with the necessary equipment, the growth and sustenance conditions and also the environmental, resources and climatic conditions. Usually, the queens are grown in the spring - summer, April – August interval. In the growing family there must be an air humidity of 40-60% and a temperature of 30ºC - 35ºC.

A.2.1. Working techniques

A.2.1.1. Operations for preparing the joung bood necessary for raising queens in order to be transferred to the nursing family

Breeding methods

1. *The arched cut* is a simple method and suitable for beginners. A light-coloured honey comb, covered in eggs and young larvae is taken and an arched cut is to be performed in the lower part of the comb. It is recommended to heat the cutting knife. The bees will raise the brood comb on the edge of this cut. In order for the queen cells not to merge, which will make the cut difficult, the larvae should be thinned (removed) on the cut area.
2. *Cutting honeycomb strips, the cells and stamping them* – considering the honeycomb contains young larvae, it should be placed on a flat support and by the help of a heated cutting knife, a row of cells or more are to be cut. These strips will be fixed by various procedures on the joints of the growth frame. The larvae will be thinned every 1-2 cm. Another procedure is to cut, or stamp cells containing larvae and fix them on growth frames. Compared to method 1, the use of honeycomb strips or cells with cut larvae has the advantage that nurse bees accept quickly and begin to breed simultaneously of the cells with the opening facing down. The disadvantage of methods that use breeding in worker cells is that queens cannot reach the optimal size.
3. *Transfer of larvae* This process means moving young larvae from worker cells into artificial queen cells. Widely practiced in queen-directed breeding, this method has the greatest advantages in obtaining quality queens. The artificial queen cells can be made of wax (obtained by hand) or plastic (purchased commercially) and will be glued or fixed on growth split rails, on growth plugs that can be easily taken from the split rails. The transfer of the larvae is done with the help of a special tool of different shapes called a transfer spatula.
   The premise of successful transfer is a steady hand and good eyesight.

A.2.1.2. **Measures for the optimal supply of food for the breeding material** in the nursing family. Growing methods:
In the case of natural breeding, the development of the queen from egg to hatching takes place in a single bee family. In directed growth the breeder usually divides the growth into several colonies:

- *The breeding family* (suppliers of breeding material – eggs or larvae);
- *The nursing family consisting of*:

○ *the starter family* – used for the acceptance in the breeding of queens of the growth material in the first 10-48h; it is an orphaned bee family;
○ *The growing family (finisher family)* – raising brood comb containing larvae is accepted. It is a family

with a queen, but this will be isolated by a special cage from the compartment where the queen cells are introduced until they are capped or hatched.

After capping, the queen cells are individually insulated in special cages and can be placed in an incubator or in an ordinary family to provide only the heat and humidity necessary for hatching.

A.3. Bee queens mating

For their natural mating, hatched queens or queen cells before hatching will be introduced into mating nuclei of various types and sizes.

After mating and egg laying, they can be taken from the nuclei and placed in transport cages as a rule or in other types of cages with accompanying bees.

Until capitalization, they will be kept in mating nuclei or in laboratory conditions – in individual cages with accompanying bees.

The type of mating nucleus is the one preferred by the beekeeper, but generally in the conditions of continental climate when nights with low temperatures are registered even during the summer, it is recommended:

- The number of bees should be at least 200 gm., and the amount of brood at the formation of the nucleus should be at least 2 dm^2 of capped brood.
- The nuclei formed by 2-4 adjacent compartments are preferable, with bee entrances in different directions, these ensuring a better thermoregulation.
- If the mating nuclei do not ensure the optimum temperature of 30-34ºC during the migration of sperm from the lateral oviducts into the spermatozoa, the amount of sperm reaching the spermatozoa is greatly diminished, these queens having a shorter shelf life, often being replaced even from the first year.
- If the mating nuclei do not ensure the optimum temperature of 30-34ºC during the migration of sperm from the lateral oviducts into the spermatheca, the amount of sperm reaching the spermatheca is greatly diminished, these queens having a shorter use life, often being replaced even from the first year.
- During non-harvesting periods, mating nuclei feed on sugar syrup or sherbet.
- If there is a partial depopulation of some mating nuclei and overpopulation of others, the depopulated nuclei will be restored by taking a honeycomb with a capped brood, ready to hatch, from an overpopulated nucleus and inserting it into that nucleus.
- The nuclei are numbered, and in the case of several nuclei kept in the same shelter, each nucleus (compartment) will receive its own identification number.

A.4. Inserting the queen into the bee family (queen replacement)

In beekeeping practice, there is a multitude of methods for introducing queens, methods with a greater or lesser success, also determined by the condition of the bee family and the main favoring factors.

First of all, some elements to determine the queen's acceptance or rejection must be taken into account, such as:

- in spring and early autumn, queens are accepted much more easily.
- in the evening, it is the opportune moment when the queens are introduced.

- in good harvest periods, queens are more easily accepted
- mating queens are more easily accepted (especially if they have spawned longer in the nucleus).
- the lack of brood can be one if the situations favouring the queen insertion.
- the presence of the queen cells make it almost impossible for queen replacement.
- young bees accept much more easily a new queen.

Introducing the queen into the cage

Remove the queen to be changed and leave it for 4-5 hours. In the evening, fix the cage (10 cm x 10 cm which can be made of wire mesh with a mesh diameter of 3 mm) and insert the queen under the cage, without accompanying bees. The cage is fixed on an area with uncapped honey and brood ready for hatching, a brood that will feed the queen until it is released from the cage. The cage is fixed by pressing until it penetrates the wax sheet (when one uses a cage made of wire mesh - otherwise the bees will gnaw around the cage and they can kill the queen).

For the cages that can be found in the market, after 1-2 days, the behavior of the bees is to be checked, and if it is normal, the bottom will be replaced with a perforated wax sheet. Any newly built brood comb will also be destroyed.

After four more days, it is checked once again to see whether the queen has been released and if the spawning has started. If it has not been released, drill a hole on the opposite side of the honeycomb. **This method is one of the safest.**

Insertion with the help of the queen transport box

The family is orphaned, or all queen cells are to be broken if there are any and left for a few hours. Insert the box in the family, in the middle of it, between two frames, at the top. After 24 hours, the behavior of the bees should be checked. If the behavior is normal, replace the cap with a perforated wax sheet. The bees will gnaw the wax and release the queen. The hive will not be disturbed for four days.

The method of introduction by surprise

The smell of bees and young queens is adjusted 24 hours before (using perfume or brandy placed on pieces of cotton wool at the bottom of the hive). The old queen is to be suppressed and all the bees shaken on a board in front of the bee entrance. The young queen is released into this cluster of bees.

Insertion through the bee entrance or above the nest

The family must be compelled to accept the queen (orphaned) and the queen must have the same smell as that of the bee family (adjusting the smell). The queen must not be scared and it should have spawned for a longer time in the nucleus. It is introduced in the evening on the bee entrance or through the upper part of the hive.

By honey smearing

Look for the queen to be replaced and instantly remove it from the honeycomb and in the same place insert the new mated queen smeared with honey. Acceptance verification is to be done after 7 days.

Inserting the queen along with the nucleus it has come from

The procedure is to orphan the family and insert the nucleus separated from the receiving family only

by a piece of perforated paper by nail. The operation is much easier in the case of vertical hives when we can place the body with the core over the basic family separated by a perforated paper. The bees will gnaw the paper and unify. After two days, we should lower the frames from the core to the lower body.

Insertion by using alcohol

It has been found that queens are easily accepted if the beekeeper resorts to narcotizing the family with 95-degree alcohol or strong fruit brandy (given some of conditions to be met among the ones presented at the beginning).

Basically, pour 10 ml of alcohol on a piece of tissue paper and place it on top of the frames. Beforehand, the old queen is extracted and a young queen paired in a cage is inserted, sideways from the paper soaked in alcohol, isolated by a very thin layer of sugar sherbet. The queen will be released before the alcohol vapors lose their effect (they remove the smell of the old queen). The method has the advantage that the queen will immediately start laying eggs.

B. PRODUCING ARTIFICIAL SWARMS ON FRAMES[3]

In order to achieve artificial swarms, several methods are used and they are described in the specialized literature. The most commonly used methods in practice are based on the principle of division. The purpose of the artificial swarms is to ensure a controlled reproduction of bee families and to avoid natural swarming. The formation of artificial swarms is done on clear and warm days, when there are harvests in nature.

The division method can be performed in several ways:

- it can be done by an equal division of the frames covered with brood and supplies or only by taking a number of 4-5 combs if the family takes up several sections.
- one or more swarms can be obtained from a family depending on their strength and production interest (honey and / or swarms)
- swarm formation by division can be done in special boxes (swarms) on 4-5 frames or in a hive of 10 frames divided in two by a sealed diaphragm and 2 opposite bee entrances to make 2 swarms at the same time.

Indicative works in case of a simple method of division:

- empty hives will be prepared along with the related elements;
- strong bee families will be chosen for division;
- the equipment intended for the introduction of the artificial swarm is brought next to the basic family (from which it is formed);
- the queen will be identified and isolated; the use of the cage for the queen, between the nest and a body above, helps to isolate the queen and eliminates the search activity of the queen.
- in the case of a vertical system, 2-3 frames with brood of all ages and 2 more honeycombs with honey-food and honey bread are removed from the nest, the bees are shaken (to avoid taking over the queen) and placed in an additional section, over the queen cage.
- in the case of a horizontal system, a cage designed for the horizontal system will be used, placed

[3] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 14-15, 2011

after the last frame, in front the diaphragm.

- the next day, the isolated frames will be transferred with the bee in the box where the artificial swarm is formed;
- artificial swarms can be moved on a hearth at 4-5 km, to avoid the return of bees to the family of origin.
- If there is no such possibility, a more vigorous swarm will be formed, containing 1-2 frames with brood ready to hatch, so that it does not cool when some of the collecting bees return to the swarm's family of origin. Stimulant feeding is to be administered. Artificial swarm should be more intensely monitored if it is not formed during the harvest periods.
- To avoid larceny, feeding will be done at nightfall, and bee entrances will be reduced to a minimum.
- on the 2nd day, a brood comb ready for hatching or preferably a mated queen is introduced into the newly formed swarm for the fastest possible development.
- an artificial swarm of 4-5 frames can reach after 40 days the level of a family of 10 frames, by adding weekly, in the center of the nest, a honeycomb good for laying eggs.

C. PRODUCING BEE FAMILIES[4]

The bee families meant for sale are bee families derived from artificial swarms which, following their development, extend on the whole basic body in the vertical system (minimum 10 frames).
The family of bees for sale can be sold in season, before the main acacia harvest, on at least 10 frames of which 6-7 frames containing brood in various stages of development and 3-4 frames with supplies of food-honey and bee bread, and bee that can occupy all intervals.
Bee families from artificial swarms can be sold in the same season as the swarm of origin, if they come from early swarms (during the acacia period I-II) or in the following season.

2.3. PASTORAL BEEKEEPING[5]

The development of beekeeping in the Black Sea Basin Region is related to the richness and diversity of honey potential, largely influenced by the geographical position of the region and the entire natural environment.
All the plants in the spontaneous and cultivated flora that are searched by honeybees for pollen, nectar or manna form the honey base of Romania, Bulgaria, Turkey, Ukraine and the Republic of Moldova.
The climatic conditions in the Black Sea Basin region determine the sequenced blooming of honey plants during a beekeeping year, their capitalization being possible by practicing stationary and pastoral beekeeping.
The stationary beekeeping is the system of sustenance and farming of bee families on the same hearth (permanent / fixed) throughout the year (both during the active period and during the winter).
The pastoral beekeeping (also called bee transhumance) is the system of sustenance and farming of bee families that includes their movement, on temporary hearths, for the recovery of harvests or for

[4] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 17, 2011
[5] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 21-22, 2011

directed pollination.
In Romania, the hearth of the pastoral apiary can be located in the county of residence of the beekeeper or in any other county in the country, based on the authorization of pastoral apiary. The hive in the pastoral area must be officially declared to the local council in whose range the pastoral beehive is located, within 24 hours from the installation on the temporary hearth.
Depending on the purpose, beekeepers can practice 4 types of pastoral beekeeping:
1. Pastoral beekeeping for increasing bee production (honey and wax), by capitalizing on the honey masses from the agricultural or forestry fund;
2. Pastoral beekeeping for increasing the agricultural production (fruits and seeds), by pollinating agricultural crops;
3. Pastoral beekeeping to maintain the working capacity of the bee family, during the period when the honey flora is missing or is very weak within the range of the permanent apiary.
4. Pastoral beekeeping for various indirectly productive purposes, such as avoiding infested areas.

The action of pastoral beekeeping involves 2 distinct stages:

a) The preparation of the pastoral beekeeping, which consists in the training of the beekeeper in several aspects. The pastoral beekeeping action includes organizational, scientific, technical and economic aspects, and in case of non-compliance with the regulation on the organization of the pastoral beekeeping action, the sanitary-veterinary norms, the forestry code or any legal regulations in force, sanctions are applied.
   The plan for the pastoral trip must be prepared in advance, establishing the number of hives to be transported, the temporary hearths, the procurement of means and documents of transport in compliance with the legislation in force, carrying out anti-varroa treatments, etc.
b) Performing pastoral beekeeping, which consists in the preparation of hives for transport and the transport. The transport of hives is practiced under two forms: with spilled hives, transported by trucks, trailers or semi-trailers, or by specially designed beekeeping pavilions, in this sense a multitude of types and variants specialized and authorized being available for this operation.

In Romania:
Moving the bee families into the pastoral area will be carried out only on the basis of the pastoral beekeeping permit, accompanied by the apiary card.
During the entire pastoral period, the beekeeper is bound to observe the distance between the apiaries of at least 100 m for the honey masses in the forests, of at least 300 m for the agricultural crops and not to place the apiary on the flight direction of the bees belonging to other apiaries and the source of harvest.
Also, the beekeeper has the obligation to inform, in writing, the Local Council in whose area the hearth of the pastoral apiary is located, within 24 hours from the installation on the hearth, on the exact place, period of stay, number of bee families located, as well as on the personal identification data, where he can be informed in case of phytosanitary treatments with chemical substances. In the field, the temporary apiary hearth must be accompanied by a panel on which the following data will be written: the contact details of the hive holder (name and surname, address, telephone number), the number of hives on the temporary hearth, the registration number obtained from the sanitary-veterinary directorate and the number of the pastoral beekeeping permit.

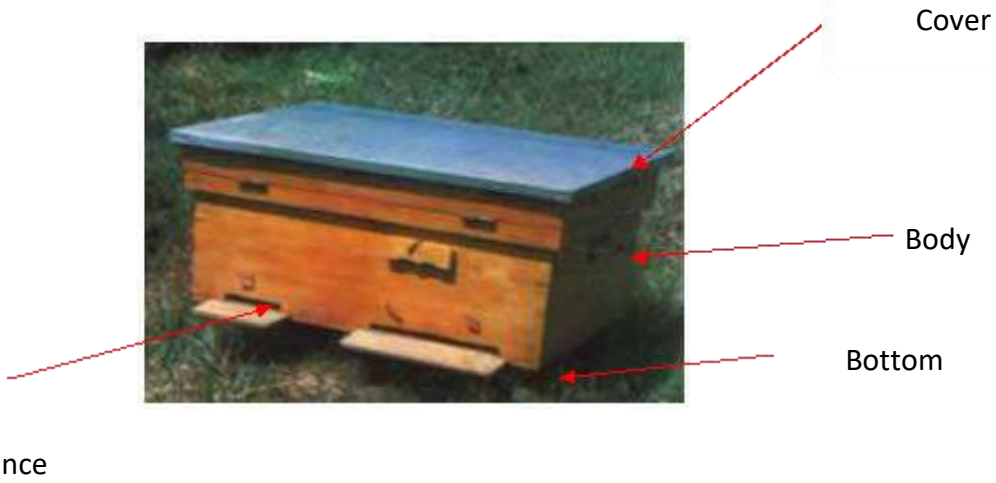
2.4. BEES AND THE MAIN BEEKEEPING EQUIPMENT

The hive is the most important beekeeping machine that acts as a shelter for the bee family, as a storage for the food supplies, the harvest and as a container for the transport of bees. The hive must have a simple construction to be easy to handle and transported.
It must have the necessary capacity for the development of the bee family during the peak periods from May to June, for the storage of food supplies (honey and bee bread) and for the storage of the harvest.
The elements of the hive must allow the development and maintenance of the microclimate conditions necessary for the nest.
The main components of a hive are: the bottom, the body, the platform, the lid, the diaphragms and the frames.

The main types of hives used:[6]

The horizontal hive

It is a large capacity hive, with 20 horizontal frames (Dadant), placed in a single row.



Component parts	Constructive characteristics
The bottom of the hive	It is fixed by nails to the body of the hive
The body of the hive	The body has a parallelepiped size, It is made of longitudinally laid planks, The front wall has, in its lower part, two 20 mm high bee entrances, but different in size, the first having a length of 300 mm and the other of 150 mm.

[6] Beekeeping technology - Beekeeper qualification course, Documentation sheets 3 - 7, pages 86-90, Dominou Association Craiova, 2010

The cover of the hide	The cover span over the top of the hive on 20 mm, resting on the body belt, It is foldable, being provided with two hinges fixing it to the body.

The horizontal hive is equipped with:

- 20 frames (dimensions : 435 mm length, 300 mm width)
- Two diaphragms (for nest reduction and separation)
- 6 platform boards, made of thin plank
- A fixing device for transport frames (A fixing bar that is placed perpendicularly to the frames. The role of this device is to tighten the frames in the hive during transport, to prevent their movement, displacement and, implicitly, crushing the bees).

Vertical hive

- In this type of hive, the development of the bee family is also horizontal to the ground, as in the case of the horizontal hive.
- The difference from this is that, in addition to the 300 mm nest frames, in which the bees grow brood, the vertical hive also has small frames, placed in the warehouses placed above the body, in which the bees put exclusively honey.
- The difference from this is that, in addition to the 300 mm nest frames, in which the bees breed the brood, the vertical hive also has small frames, placed in the stores placed above the body, in which the bees deposits exclusively honey.
- The bottom of the hive is fix fixed.
- The hive body has an almost square shape and contains 10 nest frames of 435 x 300 mm.
- One or two stores can be attached above the body, on the belt that surrounds it laterally upwards and in the upper folds.

The store frames have the same size as the horizontal hive, the only difference being their height of 162 mm (outer dimensions of 435 x 162 mm).

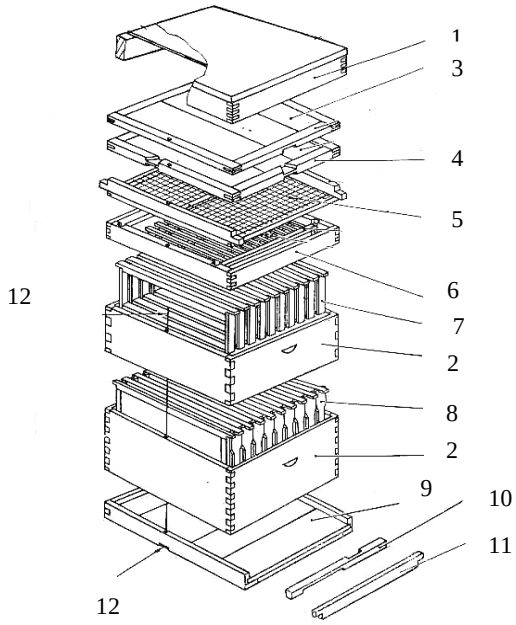
The **advantages** of this type of hive are:

- clear differentiation between the nest and the frames from which the honey is extracted;
- the ease with which honey can be extracted;
- the bee family is very little bothered by extraction;
- the vertical hive with shops is suitable for pastoral beekeeping because it allows taking the shops from the body, transporting them separately, so it is easier than in the case of the horizontal hive and it allows obtaining quality honey, on distinct varieties of flora.

The multi-storey hive

Component parts	Constructive characteristics
The bottom of the hive	It is mobile, with a single usable face. Nowadays, the double bottom is being used more and more, with both usable sides. It has a 550 mm length, exceeding the front body by about 60 mm, thus forming the flight board. It is built of 20 mm thick boards.
The body of the hive	It is made of planks. The external dimensions of the bodies are 490 x 420 x 245 mm. The front and rear walls of the bodies are provided at the top, on the inside, with a 17 mm high and 10 mm deep groove to support the hangers of the frames. On the outside, the bodies have two holes with a depth of 10 mm that serve as handles. The side walls of the bodies are pierced along their entire height by a hole with a 10 mm diameter, through which the fixing rod of the bodies is inserted during transport to the pastoral area.
The cover of the hide	It is telescopic (covers the body marginally). Inside the lid there is an empty space, where mattresses or other insulating materials are placed during winter.

- the multi-storey hive has a number of qualities that have imposed it in beekeeping practice:
- a simple construction, with divisible component parts;
- its volume can be increased or decreased, according to the needs and strength of the bee family;
- it fully meets the biological requirements of bees, which prefer the vertical development;
- it allows the use of mechanization operations in transport, by palletizing, the honey extraction on floral aprons directly from the hive bodies, etc .;
- it is considered a hive of the present and the future.



1. The cover of the hive
2. Hive bodies
3. Board
4. Snellgrove board
5. Ventilation frame
6. The feeder
7. Frames (435 X 230 mm)
8. Frames
9. Bottom of the hive
10. Bee entrance block
11. Been entrance lock
12. Holes for fastening system

Antivarroa plinth[7]

This is of particular importance in apiary management, especially as regards alternative methods for varroosis control:

- it allows monitoring the natural degree of infestation of the bee families with Varroa as a result of their natural fall on the plinth, which is why it is also called control bottom;
- it allows monitoring the effectiveness of some treatments by assessing the number of mites fallen during specific treatments and after treatments to assess their effectiveness or the level of infestation at any time of the year, but also the application of appropriate treatments.
- by lubricating a sheet of paper or other greased material (Vaseline, etc.) that is placed on the bottom tray, the mites remain stuck on it and can be counted to assess their level or the effectiveness of some treatments.
- it allows a natural ventilation of the hives in general and especially in the periods when the hives are transported in the pastoral area.
- it facilitates the treatment using Varachet (or other substances that are applied by fumigation), the wicks can be placed directly on the board provided by design;

The use of anti-varroa pedestal is a simple, economical and sustainable method in fighting Varroosis given the fact that about 20-40% of existing parasites on adult bees fall and die on the bottom of the hive.

[7] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 25, 2011

- **Constructively it is made** by replacing the plank board of the classic bottom, with a wire mesh (3 mm mesh). Below this, a galvanized sheet tray will be slid on the entire surface, which can partially or totally block the opening made by the mesh. On this plate, the beekeeper can place a sheet of white paper, which is greased with Vaseline and which can be used in counting mites.

In order to handle bee families, the beekeeper also needs special equipment to protect himself against bee stings, which consists of: beekeeping coverall, bee mask, gloves, smoker. For handling bodies and frames, the beekeeper also needs a bee scraper and a bee brush.
The apiary inventory must take into account the number of hives and the purpose pursued by the beekeeper. **For the transport into the pastoral areas** of the hives built in vertical system, different systems for fixing the overlaid bodies are used:

- inserting rods through holes drilled in the bodies.
- limiting the movement of the bodies by fixing some metal corners at the junction points of the two bodies;
- fastening the hives on pallets and trailers with special straps.

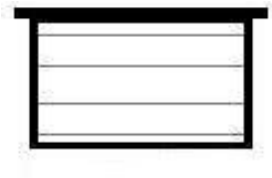
Various hive transport systems (vans, trucks, tractors or trailers) are used, which are generally based on manual loading and unloading.

The main transport systems:
• the pavilion system, meaning that the hives are located in a pavilion - the mobile containerized apiary, which can be towed by different means of transport (tractor, truck, etc.).
• another system that is becoming more and more practiced in Romania is the palletized hive transport system (pallets with various capacities), by mechanized loading and unloading (crane and / or forklift). Romanian beekeepers are also forward-looking at the modular beekeeping containers, independent of the chassis of the means of transport, transported with the help of trucks that are equipped with hydraulic hook.

Equipment for fixing honeycombs into frames[8]

Equipment for fixing honeycombs into frames	**Features**
 Block board	It is made of plank. It is sized to fit exactly in the "light" of a frame. It can be made to be adapted to the same block when fixing honeycombs in horizontal, multi-storey and store-type frames
 Frame driller	It is provided with a steel needle for drilling the side rails (to obtain the wired frames)
 Beekeeper spur	It has a toothed wheel, which is passed over the wire to be integrated into the honeycomb. To fix the honeycomb to the upper back of the frame, use the roller spur. There are also electric spurs.

Artificial honeycombs



Wired frame

Artificial honeycomb fixed on the frame

Frame drilling device

0,4 mm galvanized wire

[8] Beekeeping technology - Beekeeper qualification course, Documentation sheet 8, page 91, Dominou Association Craiova, 2010

Honey extraction equipment[9]

The tools for extracting, processing and storing honey consist of: fork, knife, tray and table for uncapping, extractor, strainer for filtering honey and settling tanks.

	***The uncapping fork*** is used to remove wax caps on honeycomb-filled cells, especially those with unevenly capped surfaces. For a better sliding on the wax surface of the honeycomb and greater efficiency, pre-heat the fork in hot water when it is not equipped with electric resistance.
	The uncapping knife is used, as the uncapping fork, to remove the wax caps from the honeycomb cells.
	***The uncapping tray and table*** re made of stainless steel. They serve to uncap the honeycombs.
	***The honey extractor*** is a device used to extract honey from honeycombs. There are several types of extractors depending on how the frame is placed: • tangential extractors in which the frames are placed perpendicularly to the rotor shaft. They can be provided with 2, 3, and 4 frames usually mechanically operated • radial extractors when the frames are placed along the axis of the extractor and it is no longer necessary to turn the frames, because the extraction is done simultaneously on both sides. They can be operated manually, when the number of frames is reduced and with an electric motor, when they are high capacity (12, 16, 28, 32, 36, and 56 frames.
	***The honey filtering strainer*** is used, during extraction, to filter the honey from wax and bee bread remains.
	***The settling tank (barrel)*** is used for honey clearing and storing.

Wax extraction equipment[10]

The tools for wax extraction and processing consist of the steam or solar wax melter and the wax press.

[9] Beekeeping technology - Beekeeper qualification course, Documentation sheet 9, page 92, Dominou Association Craiova, 2010
[10] Beekeeping technology - Beekeeper qualification course, Documentation sheet 10, page 93, Dominou Association Craiova, 2010

	***The steam wax melter*** is a low-efficiency machine used in the processing of raw materials having a high wax content. It consists of a double-walled tin dish and is covered with a lid that is attached tightly to the walls. Inside the vessel there is a sieve on which the melting combs are fixed and which will retain the marc and the other debris that are left after their processing (wires, wood scraps, etc.). Water is poured into the space between the walls, which by boiling causes steam to melt the wax or, in the case of another model, the water enters the vessel acting directly on the melting material, the wax rising to the surface.
	***The solar wax melter*** is a machine that melts the wax contained in honeycombs and caps with the help of solar energy, the heat emitted by the sun during the summer. This tool is to be placed in the sunniest places in the apiary or yard to benefit from as much heat as possible from the sun. By using the solar wax melter you get a clean, yellowish, pleasant-smelling wax.
	**The wax press** allows the extraction of wax from recast honeycombs, not only from new caps and honeycombs because it uses, in addition to temperature, the action of pressing, in waste (marc) resulting a small amount of wax (10-30%), of a lower quality, which can be extracted only by industrial processes.

Additional beekeeping inventory: the jagged scraper, the beekeeper's chair, the frame holder, box for transporting frames, the beekeeping cart, the beehive bars, the feeder, the queen cages, the drinker, the control scale, the honeycomb storage cabinet and others.

Tools and materials for raising queens: brood comb support frames (growth frames), queen excluders, hatching frames, type Nicot, Zander, Titov, on which the hatching cages are kept, queen cells block, growth split rails, growth plugs, queen cells support frames, queen cells carrying frames, cages for the queen insertion and transport.

The apiary workshop is the necessary space depending on the size and activity of the apiary and must ensure specific conditions for materials storage and enable specific activities in the apiary.

CHAPTER 3. HARVESTING AND CAPITALIZATION OF BEEKEEPING PRODUCTS

3.1. OBTAINING, HARVESTING AND CONDITIONING HONEY

Honey is the sweet natural substance produced by bees from the nectar of flowers / plants or from the secretion of living parts of plants or from the excretion of insects on living sections of plants, which feed by suction on plants and which bees collect, process and combine with their own specific substances, collect it and leave it in honeycombs to macerate and mature.

This is the general definition of honey in the Codex Alimentarius (1989) which describes all the commercially required characteristics of the product. This definition was also recently introduced in Romanian legislation. Depending on the raw material used by bees to produce honey, there are two types of honey: floral and manna.

Floral honey results from the processing of nectar and pollen collected by bees from the flowers of honey plants. It can be monofloral, derived entirely (or mostly) from the nectar of flowers of a single species: (acacia, linden, sunflower, rapeseed, mint) and polyfloral, derived from the processing of a mixture of nectar from the flowers of several plants species.

Mana honey, (extrafloral), obtained from other parts of the plant, besides the flowers, can have an animal or vegetable origin.

The components of the natural environment of the Black Sea Basin region play an important role, imprinting a number of characteristics to honey through their quantitative and qualitative value, such as color and flavors. For example, the identity of the space has spoken through flavor / assortment (country of origin):

- the lime honey selected from pure lime forests in Bulgaria (Severoiztochen and Yugoiztochen) is distinguished by its delicate specific aroma, unique taste and amber color;
- white acacia honey obtained by honey harvests from massifs / forests and plantations in the South-East Development Region of Romania distinguishes itself by a pleasant and unmistakable taste, high fluidity for a long time because it crystallizes more slowly than other types of honey, the color ranging from transparent to yellowish;
- rapeseed honey obtained from honey crops on the areas in southern Ukraine cultivated with winter and spring rapeseed is characterized by a pleasant taste, whitish color, creamy texture;
- clover honey, obtained from the honey harvests in Turkey (Zonguldak, Gümüşhane) has a pleasant flavour, a light yellow color on the first harvest and a beige appearance when crystallized, a distinctive taste.

It is important to specify/ to highlight on the product on sale, the relationship between the category / type of honey given by entomophilous plants and the beekeeping areas, i.e. to focus on determining the *geographical area of origin*, *the botanical origin* and *the authenticity of honey*.

This is all the more necessary considering the bee therapeutic products have the unique ability to provide, for prophylactic and therapeutical purposes, the synergy of the presence and action of an impressive number of substances, which are, in fact, the support of the biomedicine of the future. In this respect, FAO mentions the following sources of information as a debut in honey therapy: Mladenov (1972) who published a book (in Romanian) about honey therapy in Romania; Apimondia (1976) with articles on honey therapy; The American Society of Apitherapy which collects case histories and scientific information about all therapeutic uses of bee products.

Honey is the main product of beekeeping, valued both for its nutritional properties, as well as for its therapeutic effects.

Honey production by bees is a complex process that includes several stages:

a) nectar harvesting - starts from the moment when the nectar taken in the honey stomach is enriched with saliva, full of saccharolytic enzymes, small amounts of pollen and other specific substances. The completion of the nectar transformation into honey occurs in the hive where the collecting bee transfers the harvested nectar to another bee, which in turn, transfers the nectar to other bees, and through the regurgitation-swallowing process, the nectar is permanently enriched with enzymatic equipment, after which it is deposited into cells where the maturation process is completed.

b) the enzymatic processing - ingestion - regurgitation can continue until about 90% of sugars arrive in the form of simple sugars (monosaccharides). This stage leads to the transformation of complex sugars from nectar (disaccharides, polysaccharides) into simple sugars (glucose and fructose) with the help of enzymes secreted by bees, thus transforming nectar into a product easily digestible by bees and preservable. Honey becomes a stable and concentrated product that allows it to be stored for a longer period of time.

c) reduction of the amount of water - in this stage the concentration of the processed nectar takes place in order to reduce the water content to a level that ensures its conservation. This process is performed by the vigorous ventilation produced by the bees wings, ensuring a high temperature (35 ° C), spreading the honey on a larger surface of the honeycomb by gradually filling the cells during which dehydration occurs up to 20% water content. After this stage, the bees cover the cells with a layer of wax.

!!! The extraction of honey is done only after this maturation process is completed, namely when the honeycombs are mostly covered (that is 1/3 of their surface).

Honey harvesting and conditioning includes the following steps:

I. Harvesting honeycombs in the hive. The best time to harvest the combs is when they are at least 1/3 capped. This fact indicates to the beekeeper that the honey is matured as much as possible, so the water content is brought to the value necessary for its preservation. This stage requires the removal of bees off the combs which is done by shaking and brushing with a special beekeeping brush or by other methods used especially in professional beekeeping:

   a. Using special boards provided with a device through which the bees can leave but can no longer re-enter (bee repellents) that can be mounted over the base bodies at least one day before - it is a system used in the vertical maintenance system;
   b. the use of air blowers to remove bees between the frames.
   c. the use use of bee repellents (substances for their removal). They must be used with the necessary precautions both for the beekeeper and not to pollute the honey or the wax.

Harvested honeycombs are taken to special boxes or hive bodies and brought to the extraction chambers as soon as possible. At the time of extraction, the temperature is very important, because at 20 ° C, honey is 3 times more viscous than at 30 ° C.[11]

II. Honey extraction can be done in specially arranged spaces, either in the apiary or in other

[11] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 30, 2011

locations. Extractors of different capacities and modes of operation are used for extraction. The pre-extraction stage is the uncapping of the capped combs.

Uncapping is the operation of removing the thin wax cap that the bees cover / close with each cell with matured honey. Uncapping is made with the help of specific tools (uncapping fork, heated / cold uncapping knife) or specific automatic uncapping equipment, depending on the capacity and equipment of the apiary. At the same time, a special tray or pan provided with a honey drain screen is used for uncapping, where the wax cap is harvested and the honey can be separated to be recovered.

Regardless of the method used with the removal of the wax caps, a significant amount of honey is collected. This can be separated by using several methods:

a. free fall filtration and pressing,
b. centrifugation in special impellers,
c. melting at a controlled temperature so that the honey does not lose its properties.

The actual extraction is performed using specific extractors (impellers). The honeycombs introduced into the extractor in special places are rotated manually or automatically at certain speeds (eg. 300 rotations / min), and the honey comes out of the honeycombs on the cylindrical wall of the extractor after which it flows through an opening at their base, in tanks or containers to be picked up manually or by pumps in settling tanks.[12]

III. Honey conditioning. Bee honey (like other bee products with nutritional value) is subject to conditioning operations through which the natural qualities are not affected by technological processes and which aim at marketing the honey, with an attractive appearance, while maintaining its initial qualities. By this operation, bee honey is brought in a certain state of humidity, temperature, purity, etc.

The main honey conditioning operations that can be applied by beekeepers are as follows:

1. Pre-filtration (straining) - The extracted honey can be subjected to a pre-filtration process by placing a stainless steel or food grade plastic filter when the honey is drained from the impeller into containers.
2. Clarification (decanting) - The extracted and pre-filtered honey is placed in various storage containers (settlers) of various sizes (depending on the operating capacity) and is left for 1-2 days to decant.
3. Filtration (in case of large quantities - for large producers) - In larger packaging units there are larger containers called settling tanks, made of stainless steel that ensure the clarification of honey, so that impurities separate on top and honey can be taken as clean as possible to be bottled in jars or barrels.
4. Dehydration (dehumidification) - this operation is performed if the humidity exceeds 20%. The honey is taken up in vessels and subjected to the dehumidification process in special rooms with temperature and other controlled conditions (so-called "warm rooms") and / or by means of dehumidification installations. The process aims to avoid the fermentation of honey. This step can be avoided if honeycombs are harvested when they are at least 1/3 capped.
5. Decrystallization of hardened honey - in the case of crystallized honey in storage containers, for

[12] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 30, 2011

the honey to be bottled, it is necessary to liquefy it by heating under controlled temperature conditions. Decrystallization is one of the most important operations that the beekeeper must pay close attention to in order to preserve the integrity of the natural components of honey. Improper decrystallization leads to increased HMF, a compound resulting from the breakdown of fructose, but also to the destruction of enzymes and other biologically active substances that are termo-unstable. The most used method is to heat the honey in thermostatic chambers at a temperature of 45 ° C for 24-48 h. To eliminate the shortcomings related to crystallization or recrystallization of honey, a fine crystallization method can be applied (appreciated by consumers) by obtaining cream honey, the liquefied honey being subjected to a directed recrystallization process (Dyce procedure).

6. Blending and homogenization - is done in case of large quantities, for large producers. Thus, honey from several crops (sources) can be subjected to the mixing (blending) process and homogenization. This measure is more often applied to polyfloral honey sorts.

7. Bottling and labeling - Bottling takes place in small food-grade containers with mandatory labeling. In this context, in order to be closer to the definition of honey and to be recognized by the consumer as a natural product, unchanged by any processing operation, direct or indirect, it is important that honey produced and packaged by the beekeeper to be labeled with the mention for instance: "*Honey conditioned by the beekeeper, in the apiary* ";[13]

3.2. OBTAINING, CONDITIONING AND STORING BEE COLLECTED POLLEN

The technology of pollen collection is based on the biological peculiarity of bees to collect pollen from flowers, to transport it on the pollen baskets of the hind legs of beekeepers and to accumulate it in the hive, i.e. to store it instinctively as a food reserve as in the case of honey, in the periods when nature supplies it.

The various pollen harvesting techniques performed so far relate to obtaining freshly harvested pollen from bees before it is deposited in honeycombs. The pollen harvesting period by bees is February - October, but the pollen harvesting period with specific collectors is limited to its abundance period, namely: April - June. The pollen collected can be monochrome if it comes from the same polleniferous source (species) or of different colors when it is polyfloral, most often orange and yellow, but it can also be black, purple or red.[14] Pollen harvesting is now a profitable concern and that is why more and more beekeepers are using pollen collectors in their hives.

The pollen collected by the bees is stored in the honeycombs of the hive and once stored, it is enriched with various specific substances and pressed into cells so that it can be preserved for a long time. After being deposited in the cells, it undergoes a series of biochemical transformations, resulting in the so-called bee bread, which ensure both its preservation and a better digestibility.

The determining factors that influence the amount of pollen collected are: the plant species as a source of pollen, the weather conditions in the season, the strength of the bee family and the type of collector used. The total amount that can be harvested during an active season can be between 10 and 30 kg of pollen depending on the factors listed above.

[13] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 31, 2011
[14] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 34, 2011

All methods of pollen production are based on the following principle: bees are guided at the hive entrance to pass through the so-called active plate, having perforations. The plate may be made of wire mesh or in the form of a grid or a plate injected with polyethylene provided that the holes are 5 mm to retain the pollen grains collected in the pollen baskets on the hind legs of the bees, which then fall into a collector drawer.
The active plate can be adjusted to two positions: the working position when the collecting bees are forced to pass through it, or the resting position when it is folded so that the bees pass freely in the hive when pollen collection is not desired, and the collector must remain mounted on the hive.
The pollen is collected in the pollen drawer which is a component of the collector. The drawer is covered with a loose sieve through which the pollen clumps may go through, but not the bees, and at the bottom, it is provided with a sieve that allows the pollen to be aerated. This drawer must be easy to pick up, to empty and clean.
Some collector models have 6.5 mm side holes for drones, as they can sometimes block bees from entering the beehive.
Bee entrance collectors are provided with hanging clamps and a protective screen (canopy) 10 cm above the collector that protects the pollen gathered against the action of weather factors (sunlight, rain, dew, dust, etc.)

Models of collectors depending on their location:

- outdoor collectors - located outside the hive on the front wall in front of the hive;
- indoor collectors - located inside the hive;
- collector located under the hive: incorporated in the hive base or placed between the body and the base; • collector located above the hive - under the lid.

The collectors located between the bodies or above the hive, under the snelgrove board or the cover, ensure a lower contamination, their emptying can be done less often and are especially suitable for apiaries that cannot be visited daily.[15]

Rules on how to use the collector:

- the collector will be mounted only on healthy colonies that have at least 5-7 frames with brood and only during the period of pollen abundance (generally April - June).
- pollen collectors are not used during large nectar harvests so as not to disturb the passage of bees and thus affect the honey production.
- the pollen collector will usually be installed in the evening after the end of the flight or a few days before, without the active plates being in the working position; these will be activated when pollen collection is desired.
- if phytosanitary treatments take place in the collection area, the collectors are not mounted on the working position.
- the collector must have special side holes to ensure the passage of the drones. If the holes do not exist, once a week the drones will be allowed to pass by way of suspending the collector activity.

[15] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 34-35, 2011

- the pollen drawer will be emptied daily.
- the collectors must be kept clean.

Conditioning and storage of the collected pollen:[16]

Sifting - Pollen is passed through two stainless steel sieves with various mesh sizes. The first time we pass it through a sieve with larger meshes, which allows the passage of pollen grains but which stops the larger remains (bees, bee remains, other foreign bodies). Then, everything that passed through this sieve goes through the second sieve, with smaller meshes than the pollen granulation. What remains on the sieve is the good pollen, which goes to consumption or to marketing for consumption, whereas, what passes through the sieve are residues that can eventually be used in bee food, introduced into honey cakes used for stimulation.
Conservation has the role of preserving the quality of pollen until recovery and consumption. A preservation method is based on removing excess moisture to a minimum content of 8-10% by drying.
Drying may or may not involve a pre-drying phase. Some beekeepers can dry the pollen above the hives, under the cover of the hives, spreading it on layers of absorbent paper and benefiting from the heat released by the nest and the solar heat. A well-ventilated, heated surface protected from direct sunlight can be an effective way of drying.
For professionals, there are special machines called pollen dryers and they work based of hot water, electric heaters, or solar heat. By drying, the pollen loses about 30% of its initial weight.
The *dry pollen is stored in various containers*, in refrigerators, which ensure the temperature of + 4 ° C. It is necessary to store it at low temperatures because there may be various parasites in the mass of pollen (small beetles, mites, wax moths, their eggs).
Drying at a temperature of + 45 °C kills the active-larvae forms, the adults, but the eggs cannot be destroyed. Cold storage inactivates these forms but does not destroy them, so that after removing them from the cold storage conditions, the pollen must be consumed in a short period of time so that no new active forms of parasites appear.
Preservation can also be done by freezing, at low temperatures of -18 ° C. This preserves the qualities of the pollen, there is no need for the drying phase, but under these conditions, the pollen must be used immediately after thawing because it is a suitable environment for the development of microorganisms.

3.3. OBTAINING PROPOLIS

Propolis is a mixture of vegetable resinous substances, vegetable wax and essential oils, with specific flavors which bees collect from different plant species and which they use mainly to cover various cracks in the hive, in polishing (coating with a fine layer) honeycomb cells and other hive surfaces.
Propolis may be collected with the help of devices made of different materials.
Generally, the beekeeper can obtain propolis by:

- scraping some elements of the hive on which the propolis is found (board, grooves, crossbeams);
- increasing the space between the crossbeams of the frames, the bees filling these spaces with

[16] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 35, 2011

propolis;

- replacing the platform with a plastic net that will be lifted and cleaned after propolis;
- the use of the propolis collector which consists of a lamellated metal grill (maximum size 8 mm), a plastic sieve and a cloth (cotton) collector which are placed above the nest instead of the board (Oros type collector);

The application of the propolis collector is done as follows:

- the plastic sieve is applied over the frames, over which the collecting cloth is placed and the sieve is expected to be covered in propolis.
- once the sieve has been covered in propolis and it is present on the edge of the frame, the lamellated grate should be applied. The grate is placed in April, along with the enlargement of the nest and it is removed in autumn when the bee families are preparing for winter; the plastic sieve and then the collecting cloth are placed over the grill, after being previously peeled off to form new holes for the propolis to be deposited in
- During the beekeeping season, whenever the plastic net is covered on most of its surface with propolis, the collecting cloth - to which most of the propolis adheres to – will be detached, being placed in its initial position.
- The propolis is harvested from the collecting cloth once a year after it has been stored for a few days at low temperature (freezer).

This way, one can harvest between 100 and 300 grams of propolis / bee family / year.
The raw propolis obtained by scraping does not require special training, only the foreign bodies are removed. In terms of preservation, propolis can be packed in sealed plastic bags to maintain the active ingredients.
As propolis is soluble in cold ethyl alcohol, specific solutions and extracts (soft propolis extract) may be easily prepared.[17]

3.4. OBTAINING ROYAL JELLY

Royal jelly is the complex secretion that nursing bees use to feed their larvae and queens. Worker and drone larvae are fed only in the first days with royal jelly and later with a mixture of royal jelly, pollen and honey, while royal larvae are fed only with royal jelly throughout the larval stage.
The harvesting of royal jelly is based on the technique of raising queens, the difference being in the higher density of queen cells on a growth frame (40-60) compared to the number of queen cells in the

[17] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 36-37, 2011

breeding of queens (maximum 36) and other specific harvesting and technical details:

After the introduction of the growing larvae (in the larval stage of 1.5 days), three days are left during which the queen cells are supplied with royal jelly. After this period, the split rails with queen cells are extracted and the royal jelly is aspirated from the cells using a specific suction device.
In order to supply the queen cells with plenty of royal jelly, a series of measures for the preparation and care of the bee colonies are necessary, as well as in the breeding of queens. This way, one can get about 250 mg of royal jelly / brood comb, about 15g/ series, and, depending on the training and skill, one can get even 1 kg from 8-10 bee colonies/ season.
Preservation of royal jelly is done only by freezing or lyophilization.[18]

3.5. OBTAINING APILARNIL (TRITURATED DRONE LARVAE)

Apilarnil (crushed drone larvae) is a natural, biologically active bee product, made of drone larvae and the nutrient content in the respective honeycomb cells, harvested at a certain larval stage, namely one day before the cells are covered, respectively on the 10th day after egg laying or on the 7th day of the larval stage for drone larvae.

The following conditions are required for the production of apilarnil:

- strong bee colonies with young queen (in April, they must have at least 6 intervals of bees and appropriate food)
- the use of plain building frames or building frames equipped with mobile sections
- the optimal period is April - July and it coincides with the optimal period of natural breeding of drones;
- preparation of apilarnil production colonies by measures to stimulate egg laying in a specific succession (special incentive feeding, introduction of building frames, monitoring the building of drone honeycombs and their seeding, specific treatments for diseases that affect the young especially);
- extraction of drone larvae (10 days after laying) with the help of the harvesting device and a vacuum pump;

[18] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 39, 2011

- storage of apilarnil in the freezer in food containers at **temperatures ranging between -5 and -15 ° C;**
- the apilarnil will be harvested in clean rooms in perfectly hygienic conditions, considering that this product is easily contaminated and perishable.[19]

Apilarnil can come in the following forms:

- Fresh unhomogenized and unfiltered product, stored in the freezer between -10 degrees to -5 degrees;
- Larval triturate resulting from the crushed, homogenized and filtered apilarnil. Store at temperatures between -15 and -5 degrees;
- Freeze-dried product resulting from dehydration of the larval triturate. Store at temperatures between 0 and 10 degrees, in airtight containers. It can be stored in this form for up to 2 years.
- Lyophillisate (freeze-dried) product resulting from dehydration of the larval triturate. Store at temperatures between 0 and 10 degrees, in airtight containers. It can be stored in this form for up to 2 years.

3.6. OBTAINING BEES WAX[20]

Beeswax is produced by four pairs of wax glands in the abdomen of worker bees to build honeycombs in the nest or to cap the combs containing honey or brood; the wax is secreted as a liquid that forms very small translucent white scales (flakes) when it is exposed to the bee's sternal plates on the lower abdomen.

The wax can be obtained in the apiary from several sources:

- *Recasting old honeycombs:*

It is made annually in the apiary. Old, black honeycombs must be replaced with new ones that can be grown in the optimal periods. Every year, ¼ of the old honeycombs can be reformed. Virtually every 4 years, all honeycombs in a bee family are completely replaced, the optimal duration of honeycomb exploitation. It is believed that a honeycomb needs to be recast when sunlight does not penetrate it. Older honeycombs are a source of disease, and generations of bees that are raised, leave behind cells with smaller and smaller diameters due to the "shirts" resulting from the process of cocooning, which has negative repercussions on the growth of healthy bees of normal size and weight. Old honeycombs contain pure wax in different proportions depending on the degree of aging, for example: black honeycombs contain only 26% wax, dark brown honeycombs 36%, light brown honeycombs 70%, yellow honeycombs 90%, while white honeycombs contain 100% pure wax.

- *Collecting the wax caps resulting from the extraction of honey*

The uncapping process results in significant amounts of wax of the best quality given the fact that this cap is newly produced beeswax.

- *Scraping of small honeycombs and cells outgrown on the honeycomb frames*

[19] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 40, 2011
[20] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 41-43, 2011

Based on this operation, small combs or wax bridges built by bees are recovered, which prevent the beekeeper from detaching the frames and other component parts of the hive in the inspection work of the bee family.

- Intense use of colonies for growing artificial honeycombs and using the building frame (frame with no artificial honeycomb). This method is used to raise the wax production by the beekeeper and is applied under certain conditions, according to specific techniques, especially when there are natural harvests, in strong colonies where there are signs of wax secretion (combs whitening at the top). These frames are inserted into the hive after the last honeycomb to be built.

Wax extraction from these wax sources is most often done by the use of temperature:

1. wax extraction by using dry temperature when using the solar melter in the apiary, electric furnaces or other fuels. The solar melter is a relatively inexpensive means of obtaining wax but has a relatively low efficiency in obtaining quality wax because the resulting wax often has residues and must be re-melted by other means. It is useful in smaller apiaries as a very economical means of obtaining wax
2. wax extraction using heated water: use of the steam melter, wax extraction by melting it in water and subsequent or simultaneous pressing and phase separation - wax and water. Wax presses are used for this purpose and are practicable for extracting wax from old honeycombs.
3. a melter specially designed for extracting very good quality wax can be used to extract wax from caps, scrapers, honeycombs from building frames or honeycombs of good quality. These melters can be made of stainless materials to preserve the wax quality.
4. wax extraction by centrifugation is used less frequently and only in specialized units, with specific equipment. The melted wax is drained in special molds (made of materials resistant to melting temperature - stainless steel or plastic, the temperature that the wax can be drained in molds is 63 ° C for it to form a non-cracking block and its cooling to is to be done gradually).

In the extraction and conditioning of wax, it is important to avoid the use of equipment made of iron, copper, zinc because they change the natural color of the wax. Stainless steel is the best material to use for melting wax because it does not alter its colour. Wax conditioning consists in clarifying and washing it. The cleaning and washing is done by repeatedly melting the wax blocks in softened water (such as rainwater) at temperatures up to 90 °.

3.7 OBTAINING BEE VENOM

Bee venom is a product secreted by the venom glands and eliminated by working bees under the action of external stimuli.
The venom collection is based on the use of a specific device that stimulates the self-defense instinct of bees by using an electrical stimulus that triggers the instinct to sting and eliminate the venom, without the retention of the needle which would cause the death of the bee.

A complete venom harvesting equipment consists of:
1. Power supply to provide a 9-12 V 2 voltage.
2. Stimulus pulse generator
3. 10 electric grids with non-inductive winding of the wire network
4. the glass plates on which the venom is deposited
5. Plutex semi-elastic films for puncturing
6. electrical conductors for the connection with the grid generator
7. a scraper for scraping crystallized venom off the glass plates
8. brown glass jars with ground glass stopper.

Specifications on how to use the venom collector:

- The deployment of the venom harvesting installation is to be done only on strong and healthy bee colonies, with a large population of collecting bees as a stings source.
- The harvest period is April - September except for the production harvest periods; the collecting grids are preferably placed at the bee entrance or inside the hive on the base plate under the frames, under the snelgrove board or on the side, near the diaphragm.
- During a day, a family of bees can undergo a cycle of 4 arousals of 30 minutes with breaks between them of 60 minutes. The same family of bees can again be subjected to venom collection only after 48 hours.
- The collection boxes can be used for 8-10 harvests after which, the venom can be scraped. After harvesting the venom plates, they must be left in a room for 72 hours for the complete solidification of the venom, otherwise it will be difficult to scrape it, resulting in losses.
- The presence of sustenance crops and pollen in nature stimulates both the production of venom and the restoration of the colonies that the venom was harvested from.
- Personnel working both in the collection of venom in the apiary and subsequently in the scraping of the glass plates must be properly equipped in compliance with the protection norms in this field.
- People who are allergic to stings will not take part in the venom harvesting.
- When scraping the venom from the plates, special care must be taken to ensure that the venom is not contaminated with other bee substances (propolis, wax, substances used to glue the semi-elastic film of plutex).
- The collection of the venom will be done observing the instructions for use of the installation (described in the paper - Bee venom. Technical instructions for beekeeping producers, Mălaiu Aurel, Tarța Elisei, Editorial staff of the magazine "Apiculture in Romania" 1984) and the technical

rules described for commissioning of the ARV-03 installation (technical book of the equipment).[21]

3.8 SOURCES OF HONEY BEE CONTAMINATION

A. Sources of contamination of bee honey on the production chain in the hive

- Uncontrollable: dust, flowers, air.
- Controllable:
  - the hive and other beekeeping equipment,
  - the bee family management (treatments, feeding, etc).

B. Sources of honey contamination in connection to the harvesting, conditioning, storage chain

- materials, equipment,
- water,
- staff,
- insects, animals,
- packaging.

Contamination of bee honey can be microbiological, physical and chemical.

A. Sources of contamination of the bee honey on the production chain in the hive.

A.1.Choosing the equipment[22]

Production hives

- it is recommended to use non-toxic products for bees to protect the wood;
- lead-containing paints, insecticides, fungicides are prohibited (this information is available with traders);
- the component elements of the hive can be protected by being inserted them in paraffin, for 10 minutes, at a 150º C temperature;
- It is not necessary to paint the inside of the hives, because bees cover the inside with a thin layer of propolis;
- it is ideal for bee families to stay strong in order to be able to ensure a good interior polishing with propolis which thus ensures a natural protection;
- if the plastic that the hive is made of or other elements of the hive (frames, feeder, etc.) is not food grade, it will not be used in production.

The wire frames (honeycombs)

- It is recommended to use stainless steel wire, especially when the frames provided with the same wire are reused after the honeycombs are melted.
- The wire will be replaced each time the combs are remelted when it is made of oxidizable material (galvanized wire)

[21] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 45, 2011
[22] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 47-48, 2011

The honeycomb wax:

- when buying new honeycombs, it is ideal to receive a certificate / analysis bulletin from the supplier proving that the wax has no detectable residues of acaricides and antibiotics at a level where it could contaminate honey or royal jelly beyond the authorized limits.
- a wax circuit can be set up from the beginning, using honeycombs that have not been treated with chemicals or that have been treated only with organic acids or products without risk to health, but also using wax derived from uncapping.
- it is not recommended to use for shops, the frames with honeycombs from the base body (from the nest) that have been subjected to the treatments.
- when renewing the combs, it is advisable to remove the wax originating from the frames that have been exposed to the treatment products for several weeks. Old combs will be disposed of.

A.2. Equipment maintenance[23]

Production hives

• After use, with view to disinfection, the hives are cleaned of wax and propolis residues, flamed or disinfected with substances authorized in the food sector.
• In the case of bacterial diseases (American foulbrood), they must be flamed very well.
• The disinfection process with specific substances must end with a rinse with drinking water.
• Substances used in disinfection may be based on hypochlorite.
• To neutralize the pathogenic spores present, the wooden elements of the hive can be introduced, after a preliminary washing and drying, into paraffin (10 minutes at 150ºC)

Frames

- Frames sorting is required before storage. Consideration should be given to removing those frames that show traces of abrasion as well as frames that are too dark in color (¼ of the frames must be replaced every year, so that the combs are completely changed every 4 years).
- The honeycombs on these frames are remelted, the wax is recovered and it is re-inserted into circulation. For the wax that re-enters its circulation, it is good for the wax to melt at 120 ° C for at least 30 minutes, in order to kill the spores of the American foulbrood.
- The frames can also be washed in boiling water
- In case of bacterial diseases (American foulbrood), all frames must be destroyed by burning.

[23] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 48, 2011

Basic beekeeping toolbox

- In order to avoid contagious diseases, it is recommended to limit as much as possible the transfer of equipment and materials from one hive to another, especially from weaker hives that are most likely to have health problems, or to be disinfected between two visits (interventions) such as by going through the flame.
- Ideally, the chisel, the most used tool in hives, should be flamed or disinfected in a bath with chlorine water, after each intervention.

A.3. Material storage

- To avoid fermentation issues in storey frames, it is recommended that they should be left to be licked by bees (1 to 2 days) after the last harvest, inserting the storeys in hives before storage.
- It is important to avoid leaving honeycomb frames (devoid of supplies) in the open air due to contact with various contaminants and dust from the air, carried by the wind or animals and birds. These frames can, for example, be stored in a cabinet with shelves or in an old refrigerator.

Preventive measures against wax moths[24]

- For the preservation of frames with storey combs (production bodies) good ventilation (ventilation) must be provided. For example, the beds can be stacked and provided at the top and bottom with a sieve to create an airflow (chimney effect).
- Vapours of glacial acetic acid can in turn prevent wax moths from entering the frames.
- If possible, a biological method of treatment may be used using Bacillus thuringiensis (gram-positive bacteria which produces natural insect toxins or chemical treatment methods, possibly with sulphur wicks by fumigation in hermetically sealed stack piles.
- The freezing technique can also be used (min. 24 hours at -18 ° C)
- Products such as naphthalene, paradichlorobenzene, carbon tetrachloride are prohibited.
- If the use of prohibited products is suspected, the respective frames should be removed from the beekeeping circuit

Preventive measures against nosemosis

Nosemosis was firstly discovered in Asian bees (Apis cerana) in China in 1994, then in European bees (Apis mellifera) in Taiwan in 2005 and later on in Europe, South America, the USA and other countries; studies of nosemosis showed that bees feeding on pollen had lower levels of Nosema compared to the bees that had not been fed on pollen.

Among the measures, we can state:

- To reduce the risk of developing nosemosis, it is recommended to disinfect the frames with glacial acetic acid (which is placed in a cup on top of the frames. This operation should be performed at a temperature between 20 and 25 ° C in a well-ventilated room (not in the honey extraction chamber).
- To reduce the risk of developing nosemosis, it is recommended to disinfect the frames with glacial acetic acid (which is placed in a cup on top of the frames. This operation should be

[24] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 49, 2011

performed at a temperature ranging between 20 and 25 ° C in a well-ventilated room (not in the honey extraction chamber).

- Before relocating the bees in to the hives, it is important to ventilate the frames and beds treated as such.

BEEFAMILY MANAGEMENT[25]

A. Location of apiaries

- Hygiene, order and cleanliness will be ensured in the permanent apiary.
- It is recommended to place the apiaries in areas with a rich and diverse flora. Pollen sources are especially important in spring, but also in late summer when the winter bee grows and in late autumn to have protein reserves for the second part of winter.
- Permanent hearths will be dry, protected from the wind, with sun exposure, especially during the colder and wetter mornings - away from orchards and / or crops that are subject to regular phytosanitary treatments.
- If there are no natural water sources in the areas where the apiaries are located, it is recommended considering equipping the apiary with a drinking water drinker so as not to collect contaminated water from nature.

B. Hive inspection

- During interventions in the hive, do NOT store storey boxes and frames on the ground, thus avoiding contamination by soil bacteria.
- Use of products to soothe bees – the use of smoker / water spray - and to merge bees
- Use the smoker in moderation. Dried natural vegetable products (eg. dried beech firewood) are recommended as smoker fuels.
- **During the harvesting period, the use of resinous compounds, oils, cardboard with gluing adhesives is FORBIDDEN, as their burning can produce toxic residues.**
- Only water from the distribution network or the one meeting the drinking norms will be used for spraying to calm the bees (vaporization).
- The products used for bee merging must be food grade.

[25] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 51-59, 2011

C. Honeycomb change

- Honeycomb frames in bodies and storeys will be checked regularly.
- It is recommended that every year, approximately 25% of the honeycombs of a hive be replaced, especially those from body frames (the darkest honeycombs). Regular renewal of combs provides dynamism to the colonies and decreases the infectious pressure on them.
- Frames with production combs can be made of wax combs or food grade plastic.
- Dark brown to black combs will not be used in storeys.
- In organic beekeeping, only artificial honeycombs from organic wax are to be used.

D. Avoiding theft

- Avoiding placing hives in line.
- Avoid painting hives in the same colour, especially when they are placed very close to each other.
- Avoid any operation that could cause theft:
    - do not allow the apiary material to be licked by bees outdoors, outside the hives!
    - do not leave the frames containing honey in the open air!
    - avoid working with weak families!

In the event of theft, the source should be removed as soon as possible and the bee entrances should be reduced to the size of a bee to protect the bees.

E. Capturing and introducing swarms

- Equipment in accordance with the good practice rules listed above will be used to capture and train new bee families coming from natural swarms.
- The captured swarm will be placed on new building honeycombs.
- Avoid feeding on honey of unknown origin.

F. Pathology – Bee diseases

- Periodic monitoring is recommended to identify any form of disease.
- Treatments against varroosis will be done only with the products accepted and registered in the register of pharmaceutical products for veterinary use.
- The use of authorized medicines for organic beekeeping (such as organic acids, volatile oils) is recommended;

Notifiable diseases:

- Acarapiosis, American fouldbrood, European fouldbrood, hive beetle - Aethina tumida, varroosis and *Tropilaelaps* mite are ”notifiable diseases mandatorily”.
- For varroosis, the entire territory of Romania is considered an infestation area, therefore, the declaration is no longer necessary.

Measures to be taken:
In Romania:

- If the presence of a "notifiable" disease is suspected or if abnormal mortality is found, without being able to determine the cause, the notification must be made immediately to the local sanitary-veterinary authority, where the apiary is located.
- Veterinarians will take samples to be sent to the Sanitary - Veterinary Department;
- If any of the above diseases is confirmed, a protection zone shall be established within a radius of at least 3 km. In this protection zone, the sale, trade, transport, rental, lending, disposal of affected families, queens, honeycombs, hives or ancillary equipment from the outbreak or area shall be prohibited.
- Beekeepers are also required to apply the control measures prescribed by the Sanitary - Veterinary Department. Under the control of the agency, specific measures will be applied depending on the disease found (diagnosed).
- In the event of abnormal mortality, the beekeeper must send a sample (test piece) to the approved laboratory on his own initiative. In this case, he will bear the costs of the analysis.

Treatments

- Periodic monitoring is recommended to identify any form of disease.
- The beekeeper must apply the control strategy contained in the texts regulated at national level.
- Some veterinary medicines require a veterinary prescription. In this case, you should contact your district veterinarian.
- Only authorized veterinary medicinal products placed on the market for bees under their beekeeping form should be used, depending on the methods recommended by way of labelling, notification or veterinary prescription.
- Veterinary medicinal products for the bee diseases treatment are sold within the network of veterinary pharmacies or other specialized beekeeping stores.
- The method of administration will be observed and very importantly, the bee families will never be treated during the harvest period and / or in the presence of honey harvesting stores.
- No preventive treatments should be applied.
- Antibiotics and sulfonamides are not allowed so far - there are no antibiotic treatments for nosemosis (eg. Fumagillin is forbidden).

Residues – Contaminated honey (outside the norm) will be destroyed.
Expired medicinal products – Expired packaging and treatment products (old tapes) should be disposed of in special designed waste containers (expired medicines).

Precautionary measures to prevent disease.

- Only strong families and a honey base that provides primarily good pollen resources should be kept in the apiary.

- Honeycombs and pollen should never be left unattended in the apiary.
- Bees should not be fed with glucose-protein supplements based on honey and unsterilized pollen or whose source comes from outside their own apiary or from weak families and with signs of disease from their own apiary.
- The hives will be constantly monitored for any signs of disease.
- Materials and equipment will not be exchanged at the level of hives affected by infectious diseases.
- Use of the anti-varroa plinth as a useful tool for monitoring and reducing Varroa infestation and applying appropriate treatments.

G. Identification of bee families

- Any beekeeper must register with the Sanitary-Veterinary Department.
- This obligation applies to all beekeepers and regardless of the number of hives or the production obtained.
- In order to register with the Sanitary-Veterinary Department, bee owners must apply to the Sanitary-Veterinary Department within the apiary location - as a permanent hearth and fill in the registration application form, according to national legislation.
- For this purpose, it is advisable to number all the hives to ensure *traceability*.

H. <u>Pastoral beekeeping</u>

- Temporary hearths are to be chosen in safe areas.
- It is very important to have good relations of collaboration and dialogue with the owners or with people nearby the hearth in order to get acquainted with the treatments carried out in the respective area.

I. Pesticides / Genetically modified organisms (GMO)/ Heavy metals

- In areas with large honey crops or orchards, it is highly recommended to collaborate with owners or tenants to learn about treatments performed / planned or the presence of crops with genetically modified organisms (GMOs).
- It is important for beekeepers to ensure that apiaries are located away from spraying and spray areas (the resulting derivatives must also be taken into account).
- In case of treatment of honey resources:
    - it is ideal for apiaries to be moved from the contamination area,
- if this is not possible, the hives must be closed temporarily during the period of the sprayed product action.
- In the pollen production, treated and hazardous areas (oil pollution, heavy metals) should be avoided.
- In the case of the existence (proximity) of a genetically modified crop (within a 5 km radius), the harvested pollen risks being classified as GMO. This fact is well known in organic beekeeping where honey can be declassified as non-organic.

- To avoid the presence of heavy metals, the installation of hives in an industrial environment, polluted with heavy metals (near polluting enterprises or near areas where polluting enterprises are built) must be avoided.
- *If it is not possible to remove the source of contamination, the apiary must be moved from that area!*

J. Feeding

- Artificial feeding is allowed only in cases where the survival of bee families is endangered, and inspection and certification bodies - by way of derogation - may authorize artificial feeding with sugar or sugar syrup or substitutes obtained from organically grown crops.
- Artificial feeding is stopped 15 days before the start of a production harvest.
- If there is a suspicion on the presence of honey syrup, the honey will be harvested separately and given to the bees in winter feeding.
- If the presence of illegal (prohibited) products is suspected, honey will be deposited in specific containers with view to destruction.
- The use of a prohibited product (eg. purchased products based on unsterilized honey and pollen that may contaminate with spores and mycelium of bee-specific diseases, produced with the addition of prohibited drugs).

Sugar based feeding

- With beehives destined for the honey production, there is no type of feeding during harvesting period and /or in the presence of honey harvesting devices (production stores). Feeding is allowed only when the apiary produces Royal Jelly.

Producing the food supplements by beekeeper.

- Only sugar of food quality standards shall be used.
- For syrup preparation, only drinking water that complies with standards shall be used;
- Sugar will be stored away from any chemical and/or biological contamination (eg. Away from rodents or other insects, dry room, sealed bags etc.)

Products industrially obtained

- there will be used digestible sugars for bees;
- syrup must be monitored so that it won't ferment.

<u>Stimulation feeding</u>

Honey based

- There should never be any feeding of bee families with honey that comes from other apiaries other than their own in order to avoid transmitting the pathogen agents and/or other residues from other apiaries.
- There should be no spare frames of uncontrolled origin introduced into the beehives.

Pollen based

- Suspicious pollen or inadequately stored pollen should be avoided.
- Pollen must have a known origin (coming from one's own apiary, from healthy bee families).

Carbohydrate and glucose-protein based cakes

- They must be prepared using honey and/or pollen that comes from one's own apiary and they must not contain toxic products or veterinary products (please, request a quality certificate from the supplier!).
- These products shouldn't be used unless they comply with the food quality standards and they are free from any antibiotics or sulfonamides addition (validated by supplier's certification).

It is very important that the beekeeper is highly attentive and avoid using any prohibited product (eg. Supplements with antibiotic addition).
If the honey contains any forbidden products, it will be destroyed.

A. *Contamination sources by way of harvesting, conditioning, storing*

B.1. Honey harvesting

B.1.1 Placing stores and production bodies

In case of buying bee families with food supplies, it is recommended to take out excess supplies before placing the supplementary production devices (stores).

B.1.2 Removing the bees from harvesting frames

Smoker will be used with moderation for harvesting stores/ devices with honeycombs and other methods that could lead to honey contamination should be avoided.
Allowed methods for bee removal from harvesting stores:

- A bee blower is recommended to be used;
- Using the bee removal board, that should be placed a day before collecting the harvest bodies, is the safest and less aggressive method for the bees;
- The use of food repellents is admitted.

Non-food substances for bees removal cannot be used (eg. nitrobenzene, benzaldehyde, etc).

Presence of foreign detectable odor/taste

The honey that presents odor or foreign taste (for instance smoke) cannot be sold as food. However,

it can be used for bees' feeding.

Bee brood presence in collecting frames

- In order to prevent the queen bee from passing into the collecting body, a queen bee isolating grid can be used.
- The honey from combs that contains bee brood will not be extracted in order to avoid honey contamination with bee larvae.
- If the presence of bee brood is observed in combs (frames) from harvesting bodies, these will be inserted into the hive so that the bee brood can hatch before taking them into the extraction room.

B.1.3. Removal of stores and production bodies

- It is recommended that before collecting the honey stores/devices, the humidity of honey be verified using a refractometer.
- If you do not possess such a device, you should check by shaking the frames, not to have honey drops flowing. Ideally, the average of controlled humidity should not exceed 18% and under no circumstances this should exceed 20%, the maximum admitted limit.
- It is advisable to extract the stores/bodies in a dry environment.
- Honeycombs should be extracted when the combs are already accurately uncapped.
- Water sprayers are not to be used in order to calm the bees.
- If there are honeycombs of uncontrolled origin, it is recommended to have the honey extraction done separately.

Collecting the honeycombs in a high humidity environment:
If humidity level exceeds 20%, dehumidification is compulsory and it is recommended when humidity exceeds 18%.

B.1.4. Stores and production devices transportation

- For the transportation of harvest combs clean supports will be used, suitable for transport.
- After bringing the devices in the extraction room/ lab these will be placed on clean supports in stacks, ensuring that space is closed in order to avoid theft or dust contamination or other contamination agents.

B.2. Extraction rooms, conditioning, packaging, storage

Here are possible contamination sources of extracted honey (inside the extraction room) and during the conditioning and packaging :

- the air (from extraction or packaging room)
- handling (skin infections, sneeze or fecal matter contamination)
- cross contamination (especially from animals and food products)
- equipment (including food remains and water), installation and products from extraction,

conditioning and packaging room;
- floors, walls and ceilings can be also “pools’ of microorganisms that can enter food.

Risks that may generate the depreciation of the honey quality:

1. Biological risks: contamination with bacteria, different parasites, and yeast. These occur due to lack of hygiene or by using product that is difficult to maintain.

Measures to remove these risks:

- Maintaining the products in perfect cleanness, washed and dried. Cleaning must be performed after each use (yeast culture);
- Using products that are easy to be removed to ensure a thorough cleaning afterwards. Avoiding biological risks is ensured by maintaining:
    - Clean rooms, washable in every direction;
    - Floors must be level to allow efficient washing (propolis and beeswax tend to stick);
    - good air ventilation in order to ensure a dry environment ;
    - dehumidifier to drop humidity under 60%;
    - sealed bee openings;
    - the access of domestic animals is forbidden.

2. Chemical risks: residue from cleaning and disinfection products, grease and oils from machines. Honey is hydrophilic (it absorbs humidity), and is sensitive to foreign smells from air thus here are some recommendations:
    - it is forbidden to store volatile chemical products or smelling in extraction, conditioning and packaging rooms;
    - it is forbidden to smoke or it is forbidden presence of any type of gas : heating gas or car gas ;
    - chemicals risks derive from honey getting into contact with other products: thus, only products made of food-grade quality materials (stainless steel or PVC) are to be used;
    - cleaning and disinfection products must comply with the food use (most often, they are cheaper than standard cleaning products);
    - water must be drinkable, better if it is warm water;
    - for oiling mobile elements, only food quality oil is to be used.

3. Physical risks: hair, glass, metal, paper, contaminated packaging.
   Physical risks derive from products of low quality (punctured and rusted filters) or that have a different purpose. Before use, the state of material must be checked in order to avoid any residue or dust; after filtering, honey must be covered and if necessary, proceed for the second filtering. Package must be clean, washed and dried before.

3.9 HYGIENE REQUIREMENTS FOR BEE EXTRACTION SITES[26]

- Extraction room must be well closed so that no insect or small animal could enter.
- It is forbidden to have domestic animals in the extraction rooms.
- Smoking is forbidden in the extraction room.
- Dust, smoke and car gasses are to be limited.
- It is forbidden to store chemical / cleaning products in the honey extraction and storing area. These will be stored in a separate room in a closed locker.

The extraction rooms must offer good working conditions:

- Good light;
- An adequate height, limiting the transport of heavy equipment within rooms;
- While professional beekeepers work in one or more specific rooms, that are in service throughout an entire year, small producers can use a room at their home that complies with all the necessary requirements for hygiene (temporary/seasonal rooms);
- To have in place occupational health and safety;
- The working process must be run with a minimum of energy consumption;
- Jobs description must be well defined;
- Tools, installations must be placed close to the working point and ensure continuity of maneuvers.
- Stairs and uneven floors are to be avoided as much as possible.

The maintenance of extraction room

- It is compulsory to have warm and cold water in the room, or in the proximity in order to facilitate the cleaning of the room and of products;
- The water must come from the distribution network or comply with drinking rules;
- Disinfectants that are used must be approved by the Public Health Authority.
- The extraction room must be cleaned with warm water and disinfectants at least before each extraction period.
- Honey contact surfaces must be washed before and after each extraction of each honey type;

The extraction rooms can be: permanent rooms, seasonal/temporary rooms, or collective extraction centers (within groups of producers, associations etc.)

1. Permanent extraction room:

General characteristics:

- In the beekeeping season, the room must be dedicated exclusively to honey activity and honey products.
- It is important to clean room as easily as possible; inaccessible places shall be avoided.
- It is recommended for these rooms to have a bee removal system.

[26] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 63-65, 2011

Placement:

- Permanent extraction room must be placed and arranged in a protected area away from strong and/or any fetid smells and from other cause that may affect the hygiene of products;
- Extraction room must not have a direct link with other rooms that might become source of contamination (restrooms, garage, workshops). A closed door with no window is enough to ensure separation.

Setting up permanent rooms:

Floor

- Floors must be waterproof and washable;
- Ideally, the floor should be level to ease the cleaning of propolis.
- To allow easy cleaning of propolis by scrapping, plinths may be straight.
- It is necessary to have a good evacuation of wastewater.

Walls and doors

- Walls should be smooth;
- Parts of wall that are affected by honey drops or that enter into contact with honey stores must be washable.
- Materials that made the up the walls must be solid and washable.

Ceiling and lighting

- The ceiling must be easy to be cleaned of dust.
- Good lighting of the room must be ensured (Natural or artificial light). There should be a good protection around the lighting source in order to avoid electric shocks.

Restrooms, washbasins, sinks

- Washing basins (sinks): will be equipped with tap water source or water that complies with drinkable water standards;
- It is important to have in place hand drying systems that avoid contamination (towels, paper rolls)
- It is necessary to have a sensor based tap water, where conditions allow installation of such device.
- In order to ensure a good hygiene, it is necessary to have restrooms that are not directly linked to the honey extraction room.

2. Seasonal fixed or mobile extraction room

Considering the honey production is a seasonal activity and that the risk of microbiologic contamination is very reduced and honey itself is a product with antibiotic properties, other types of rooms meant for other purposes may be use as extraction rooms if they do not induce irreversible

contamination and degradation, thus diminishing the honey quality.
During the honey extraction and conditioning periods, these types of rooms must be reserved exclusively for honey collecting and extraction activities.

Features of the seasonal room:

- Elements that come in direct contact with honey must be the food-use type, resistant to corrosion and easy to wash.
- Surfaces that might be smeared with honey (floor) must be waterproof so that they do not absorb water and are washable.
- Other surfaces must be easy to dust clean;
- There should be easy access to cold and warm water source within the room or in the proximity.
- Room must be accessible and easy to clean, to have all necessary fitting as in permanent extraction rooms.
- In season, any other activity or contamination source will be avoided.

3. Collective extraction centers

- These have to comply with the norms for the permanent extraction rooms;
- There has be a specific user guide of the room to include the name and address of the users, evaluation of honey quantity and other observations;
- There should be a specific procedure in place for room cleaning and products removal.

3.10. REQUIREMENTS FOR THE HYGIENE OF HONEY EXTRACTION EQUIPMENT[27]

Extraction equipment

The type of products

- The use of products made of food-use type, resistant to the acid PH of honey. It is advisable to use stainless steel.
- The parts of equipment that enter directly in touch with honey must not be made of wood.

Maintenance

- The state of equipment in terms of cleaning must be checked before usage.
- Before and after each harvest, the surfaces that enter in direct contact with honey will be washed and if necessary, cleaned with disinfection products attested by the Preventive Medical Authority.
- The axels, bearings of equipment above the honey must be greased using oils adapted for food - farming industry.
- Before use, the general state of equipment, recipients' cleanness, rust free parts, or incorrect fitting of parts are to be checked.

[27] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 66, 2011

3.11. REQUIREMENTS FOR HONEY STORAGE PLACES[28]

- Storage places must be protected from animals or contamination sources of microbial or chemical contamination ;
- It is forbidden to have rodents, birds, bats in storage areas as their droppings can be extremely infectious.

3.12. REQUIREMENTS FOR THE HYGIENE OF HONEY EXTRACTION STORAGE[29]

Bee removal

- It is important to avoid the presence of bees in honey storage and production bodies, before introducing them into the extraction area.
- To avoid overtaking bees together with the honeycombs harvest, it is ideal to place the bee removal devices above the production stores and bodies.
- In the extraction room, it is advisable to have a tapered exit in one corner of the room for the bees to be able to get out, but to prevent them from getting in.

Humidity in the extraction room

- The extraction room where the collecting stores are placed for more than 48 hours should have a relative humidity level lower than 55%
- It is recommended to verify the relative humidity level of the room during its use.
- When the air humidity is higher than 55%, it is recommended to use dehumidifier few days before placing the honeycombs stores.

Operations performed above the honey

1. **Dehumidification of honey in stores or honey harvest bodies**
   - If this hasn't already been done, the humidity of honey will be checked with a refractometer.
   - Dehumidification of honey stores depending on humidity will be performed in warm rooms (max. 45°C) provided with dehumidification devices and air conditioning.
   - When needed, collected honeycombs shall wait even for few days until the humidity will drop to the admitted limit (20%).

2. **Uncapping and extraction**
   - Honey shall be verified for abnormal color, smell, fermentation. Any suspicion (fermentation process, abnormal smell) must be eliminated before or during uncapping or extraction without mixing it with the good sources.
   - Depending on the source of the problem, honey will be returned to bees, preferably after

[28] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 67, 2011
[29] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 68-69, 2011

heating at a temperature > 75°C for 3 – 4 minutes or destroyed in case it is a dangerous for the bees.

Uncapping

- After collecting, the uncapped wax will be stored in closed recipients.
- This will be handled as soon as possible (centrifugation, honey recovery, remelting the wax)

3. Filtering (Prefiltering)

- The state of the filters will be verified before any use.
- It is compulsory to filter (prefilter) honey. Ideally, honey has to be filtrated in several stages through: rough filters, medium filters and fine filters.
- The finest filter must have between 0,5 and 0,2 mm (except for the heather honey).
- Filtering must stop visible particles passing into honey.
- Filter and the recipients filling must be continuously monitored to avoid overflowing.

4. Honey maturation and foam removal

- After filtration, honey must be allowed to mature considering the volume of recipients as well as the room temperature (a temperature above 20° C is necessary so that honey could get as liquid as possible and thus maturation could take place at its best).
- Foam and particles that come to the surface (wax and bee remains) will be removed, paying attention to foam not to get into the honey.

5. Honey conditioning

- After filtration and maturation, all containers must be covered and any foreign elements, impurities must be avoided.
- Insects' presence should be avoided.

6. Mixing

- Only clean equipment must be used, that do not generate dust and that are reserved only for this operation (stainless steel material);
- Tools (for instance, mixing blades) must not rub against wall;
- Avoid introducing air into honey as it leads to unaesthetically appearance (emulsion does not affect health).

7. **Liquefaction**

- Avoid honey liquefaction using an inadequate equipment thus risking superheating honey (over 45°C) and degrading honey quality.
- Heating must be as low as possible and short timed.
- The value of HMF content (hydroxymethylfurfural) will be determined only by a specialized laboratory.
- If this value is ≥ 40 mg/kg (maximum limit accepted), honey is industrial or will be returned to bees (this parameter has no influence on public health), but it is a quality indicator.

Honey storage

- Honey will be stored in a dry place, chilled (ideally +15°C) and away from direct light.
- Heating up rooms over 35 °C is forbidden.
- If honey humidity is over 19%, storage will be made in a colder place (under 11°C).

3.13. REQUIREMENTS REGARDING STAMPING AND LABELLING[30]

HONEY TRACEABILITY

- Any type of recipient that contains honey must have its traceability mentioned on its body (not on the cap):
  - Harvest identification (honey that comes from the same apiary and it is harvested at the same time).
  - Batch and type of honey (honey that comes from different harvests or from a mix of honey intended for packaging).

Packaging using small recipients

Honey recipients

- Use only recipients meant exclusively to honey packaging, perfectly cleaned.
- Jars must not present any flaw.
- It is compulsory to wash glass jars with drinkable water before use.

CAPS

- Recipients should have airtight sealing.
- For the glass jar preferably use caps that care completely airtight sealed.
- It would be advisable not to use plastic caps with “click” gripping system.
- Metallic caps must not be used.
- Plastic caps must be verified for food use validation.
- Low quality caps or rusted caps are not to be used.

Honey labelling

The following information must show on the label:

- Product commercial name : honey/ floral honey /forest honey, type of honey, validity date (max. 2 years after packaging), conservation conditions in batch number (or other information such as sample analysis) in order to ensure traceability.
- Expiration/consumption date (2 years from conditioning) ;
- In case of honey being mixed with products from another country, the country of origin must be mentioned on the label.
- Geographical indication can be added if entire quantity comes from the same area.

[30] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 70-71, 2011

- A botanical origin can be mentioned (single-flower honey; double name or details referring to the assortment). For this situation, it is also necessary to have a specific sample analysis (pollen sample).
- Quality standards can be mentioned if these can be verified and if they bring in an added value to the base product.

Pollen storage[31]

- Dry pollen must be stored in a dry, cool place (ideally the temperature should be lower than +15°C) and kept away from light.
- Frozen pollen must be kept at a temperature under -18°C.

Royall Jelly[32]

a.1 Queen cells for Royall Jelly production

- All elements of hive, wire and wax are accepted with the Royall Jelly production process on the condition of the above-mentioned specifications, namely they must be food-grade.
- It is recommended to use only wax coming from uncapping in order to make artificial queen cells.
- In case of plastic reusable queen cells, this must be made of food-grade material.
- These cells must be fixed on a support using food adhesives, with bee wax using a non-toxic mechanical procedure.

a.2 Cleaning of Queen cells

- before storing them, all plastic queen cells used in the production of royal jelly, bees must be washed in drinking water (under a spray of tap water) as quickly as possible.
- regarding the storage space of the material, some precautions are necessary: absence of chemicals and smoke sources in the storage room, place must be clean and sanitized.

a.3 Harvesting Royall Jelly

Breeding larvae

- The transfer must be carried out in good hygienic conditions.
- All materials used in breeding and the transfer must be food-grade and must be washed and disinfected in advance.
- The washing water for washing, when used, must be drinking water.

Transfer

- The transfer is made from healthy families and outside treatment periods.
- The wet cheesecloth used to protect larvae from the sun heat must be clean and dampened with drinking water.

Harvesting

[31] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 75, 2011
[32] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 76-78, 2011

- Removal of bees from the split rails must be done with a minimum amount of smoke.
- Queen cells must be protected from any source of alteration (sun) or contamination.

Transport

- The recipients used for transporting the queen cells must be food-grade, clean, disinfected and air-tight sealed.
- Royal Jelly will be stored immediately after collection in refrigerators for a limited period of time or in freezers.

a.4 Royal Jelly conditioning

Rooms and equipment hygiene

- Royall Jelly conditioning is to be conducted only in rooms that are compliant with the norms defined for the permanent extraction rooms.
- Conditioning Royall Jelly operations will be conducted in a special room or in the honey extraction rooms outside the working with honey periods (campaign flow).
- All elements that get in contact with Royall Jelly (extraction material, filtering material, transfer lancet, jars, hoses) must be food-grade. They have to be clean and easy to maintain, to wash and disinfect, before and immediately after use.

Overheating

- Parts that are heated must not enter into contact with the Royal Jelly.

Removing larvae from cells (Queen cells)

- Royall Jelly will not be extracted from those cells in which dead larvae have been found.
- Removal of larvae before extraction is compulsory. During this operation, you must pay attention not to hurt them and have any hemolymph leakage into the Royal Jelly.

Extraction

- Extraction can be performed with the help of spatula, a vacuum pump or with a device that uses centrifugal force.
- Royal Jelly extraction operations should be made on the same day of taking out the queen cells split rails, as soon as possible.

Filtering

- It is recommended that filtration be performed at the same time or on the same day in order to remove visible foreign parts.
- The filtering device will be food-grade and resistant to acids with mesh size holes ranging between 0,4 and 0,7 mm.

Freezing

- Royal Jelly will be frozen at a temperature of -18°C.Please note that, once frozen started, it cannot be interrupted until the final use. It is compulsory to establish a maximum period of preservation.

Packaging

Recipients must be perfectly clean and air-tight sealed.

a.5 Royal Jelly labelling

The following legal information must be shown on the label:

- Commercial name: fresh Royal Jelly or frozen Royal Jelly, expiration date: fresh maximum 6 months, frozen: max. 18th months from the harvest date.
- This date should specify day, month and year – storage temperature: fresh between 2 and 5° C, frozen < -18°C, net weight, name and address of beekeeper (conditioning person or seller), harvest country (optional), number of lot and production data.
- The Royal Jelly cannot be re-frozen!
- Only nutritional data and nutritional data authorized by EFSA (European Food Safety Authority)

a.6 Royal Jelly storage

- Pre-packed Royal Jelly must be protected from light and kept at temperatures between 2° and 5°C in both storing and the selling places.
- Frozen Royal Jelly must be kept at a temperature under -18°C (max. 18 months after the harvest date).

3.14 REQUIREMENTS REGARDING HEALTH AND PERSONNEL HYGIENE[33]

The staff hygiene is very important in the production stage and especially in the product conditioning stage.

- It is important to ensure a good personal hygiene.
- Clothing must be clean and adapted for production (cap, wear with closed pockets, single use shoes etc.) to avoid falling hair or other objects.
- Personnel must not have contagious diseases.
- Personnel must possess a medical certificate allowing them to operate food products. This certificate mut be renewed annually.
- To avoid biological risks, personnel with skin diseases, intestinal or respiratory disease cannot work in this domain.
- Protection of potential wounds that could enter in contact with honey is necessary.
- Before any operation, it is compulsory to wash hands. There should be access to hand washing devices and also for hand drying (tissue paper).
- Smoking, drinking, eating are forbidden in the extraction room.
- Personnel is the most common source pf pathogenic germs.
- It is recommended to have appropriate working clothes that are easy to clean. In the task book or a certificate of conformity, it is recommended to have single use clothing, cap, light blouse worn directly on skin, shoes protection.

[33] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 79, 2011

Chemical Risks : hands must be clean and/or gloves should be worn.

Physical risks:

- Personnel must wear single use equipment with cap to avoid hair or other objects falling.
- Control the contamination sources.
- Secondary contamination sources are controlled by (translator's note: text missing from the source document).

Applying the standards disinfection rules represents applying best practices in the production sector.

CAP. 4 MEASURES TO PREVENT AND CONTROL DISEASES IN BEES

4.1. Anti-varroosis methods and procedures

Varroosis is the most common hive disease that can occur regardless of how much care the beekeeper pays. This disease is caused by a (destructor) acarian, Varroa Jacobsoni, which attacks bees in all stages of life.[34]

The infestation of colonies takes place gradually over a period of 2-3 years, leading to their destruction. In beekeeping, the fight against Varroosis has become a priority and a number of treatments have been designed to limit its harmful effects.

The potential for reinfestation is permanent (drift, theft, swarm, over-population with bees on a certain areal). At present, with the existing means of treatment properly carried out, varroosis cannot be eradicated but can only be kept at a level that does not affect the productivity threshold of bee families.

Disease debut

At the beginning of the infestation, the presence of the mites is not observed. Several methods may be used to detect the disease in time and to determine the degree of infestation.

One way would be to examine the control sheet and to establish the number of dead and fallen mites on it; if in June and July 5-10 pieces per day fall, it means that bees are suffering. Another method is to examine the cells containing drone brood, the mite prefers this brood, and the beekeeper can easily see how serious the situation is by breaking down a few cells.

During the last phase of infestation, the mites can also be observed with the naked eye on bees and bumble bees if you look carefully.

At varroosis debut, bees and drones show malformations, the young is speckled, the larvae die in unnatural positions, the bees no longer take care of the bee brood and even leave the hive. In general, the spread of the disease is done by losing track of infested bees, theft, genetic material without a health certificate entering the apiary, etc.

Identification of the aetiological agent[35]

For correct monitoring of the mites, the beekeeper should know some data on the biology of this mites:

[34] https://ec.europa.eu/info/food-farming-fisheries/animals-and-animal-products/animal-products/honey_en

[35] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 93-95, 2011

1. The Varroa destructor parasites both adult bees and bee brood.
2. The adult female measures approximately 1,1 mm long and 2,6 mm wide, weighs 0,14 mg and has a brown-reddish color. Males are much smaller and less colored.
3. The body of the parasite is dorsoventral flattened, which allows it to insert between the abdominal tergites of the bee.

The adult female of Varroa destructor

4. The lifetime of the parasites depends on temperature and humidity, in practice it spans from a few days (27 days) to a few months (5 months).
5. The life cycle is conducted only in the bee family and has two phases: the phoretic phase - on adult bee and the reproductive phase - inside the cells containing juvenile brood.
6. In order to multiply, the adult female enters a brood cell just before being capped (she prefers brood of drones). After approx. 4 hours since capping, it starts feeding on bee brood.
7. After 60-70 hours, the acarian female starts to lay the first egg from which a male will emerge and then from the next eggs after approximately 30 hours, only females result (4-5).
8. The growth duration is 5-6 days for male mites and 7-8 days for female mites.
9. The resulting females will pair with the male (sibling) prior to the bee hatching, thus its role and life are limited only the inside of the brood cell. By having only one male, the mite increases its chances of breeding inside the bee family.
10. Note also that a female may multiply more than once (3-4 times in summer) and the usual rate of multiplication (number of adult females produced) is 1,7-2 times in the working bee brood and 2-3 times in the drone brood because of the longer development period of the drone brood.
11. The development and condition of a bee family therefore influence the number of mites and, depending on the situation, it may increase several times (12 to 800 times), so an effective treatment can reduce the number of mites to the initial level.
12. The mites are feeding themselves with bees' hemolymph from both the brood and the adult forms, weakening them both nutritionally and in terms of immunity, and at the same time being a very important vector of transmission of specific viruses.

Clinical signs in severe infestation which may be followed by the collapse of the bee families:

- Significant decrease of the adult bee population, possibly a small number of dead bees on the hive bottom.
- Adult bees with wings and deformed abdomen.
- The mites are in large numbers and often visible on adult bees, on drone brood, or on the bottom of the hives.
- Various abnormalities of brood (if the signs are not specific to other brood diseases - e.g.

American and European foulbrood).

It should be noted that **there is no exact limit for the number of mites causing the collapse of bee families**, a certain degree of infestation which does not cause damage to one bee family may be very damaging to another family. This may be due to the presence of associated viruses, the natural resilience of bee families or other environmental factors.
However, various limits concerning this aspect are mentioned in the related literature, for example in England it is considered that the varroa population should be kept below **the maximum limit of 1000 mites/bee family**, while in other European countries and in the US, the maximum limit of 3000-4000 mites/bee family is considered. However, this limit depends on the period of the year, but also on other factors related to the development of bee families.

The population of varroa mites in a family depends on 2 factors:

- number of mites that reproduce in the bee family.
- the inflow of mites from other bee families (derived, theft, pastoral, etc.)

If at the beginning of the season there is a small number of mites, then the number of mites may remain below the limit of 1000 during the entire period of the active season, but if an external inflow of mites occurs during the season, the limit can be exceeded and without treatments, the life of the bee family is endangered.
In determining the mites population, it should be considered the fact that **the number of mites doubles by reproduction every 4 weeks**, although there are a higher number of factors that accelerate or limit this process.
Actually, it is very important during the entire active season, but especially in spring and autumn, to know the degree of infestation (number of mites) in the bee families in order to be able to act properly with the necessary treatments.
For the implementation of good apiculture practices it is very important that beekeepers learn to recognize varroa, to assess the varroa population (infestation level) over the season and interpret the resulting values to proceed with treatments or biotechnological methods of control at the appropriate time.
Modern beekeeping is based on the management of varroosis. The purpose of the management of varroosis is to keep the varroa population below the limit that does not affect the economic performance of the bee family.

In order to monitor the range of infestation, the beekeeper must consider:

1. **The number of assessments.**
   It is important to assess the varroa population in early spring (March) and at the end of the period of harvest capitalization and also the bee growth for winter(August), and when having time available, further assessments can be made during the active season - after the first important harvest e.g. acacia (May) and during the maximum development of bee families (June).
2. **The number of bee families assessed**. The number of mites varies greatly from one bee family to another and monitoring of all bee families in particular at large apiaries is difficult to implement. It is very important in monitoring the number of mites, to introduce especially strong bee families,

but also several medium or weak bee families (10-15%).

Evaluation methods at hand for the beekeeper[36]

A. The method of natural fall and control sheet evaluation – scientific studies show that the number of mites fallen per day on the hives positively correlates to the total number of mites present in the bee family.
For the application of this method, the number of fallen mites/day in a time sequence will be assessed. An important piece of equipment is the anti-varroa bottom which, by construction, allows the application of a control sheet and its display for easy monitoring of this parameter.
The method requires counting naturally fallen mites using a 7-day reporting period. Place the control sheet greased with white grease on the first day morning of the assessment period and at the end of the 7th day and count the naturally fallen mites. The result is divided by 7, thus obtaining the number of daily mites.
When a large amount of detritus falls on the control sheet, the mites cannot be easily counted, thus the entire quantity fallen on the sheet is placed in a bowl with sanitary alcohol. Most of the mites will rise to the surface while the remaining wax or other impurities will fall to the bottom of the recipient.
For example, specialized literature in the UK shows that there is a range of information to support beekeepers in assessing the number of mites and establishing the degree of infestation. The figures are indicative for the situation in the Black Sea basin where conditions are slightly different:

Period	Naturally falling method (number of fallen mites /day)[37]		
	Massive infestation	Medium infestation	Low infestation
March, April, May	≥ 8 Effective treatment with acaricides and alternative control methods (biotechnological)	4-8 Biotechnological methods or/and acaricides	≤ 2 Alternative methods of control Acaricide treatments are not applied
June, July	≥ 10 Effective treatment (acaricide treatment and alternative control methods)	6-10 Biotechnological methods or/and acaricides	≤ 6 Alternative methods of control (biotechnological) shall not apply with acaricides treatments
August	≥ 4 Effective treatment (acaricide treatment)	≥4 Acaricide treatment	≤ 4 Acaricide treatments should not be applied
October	≥ 8 Effective treatment (acaricide treatment)	≥8 Acaricide treatment	≤ 8 Acaricide treatments are not applied

All acaricide treatments should be applied according to the specifications on the package leaflet of the authorized products.

[36] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 95-98, 2011
[37] Managing varroa, The Food and Environment Research Agency, 2010

B. The method of uncapping a brood drone area. It is applied by assessing the number of mature mites that can be viewed on the drone brood (red-eye pups) by uncapping 100 cells with the help of an uncapping fork. If 5-10% of the pups are infested with varroa, severe infestation of the bee family will be considered. The method is less accurate than the method of assessing natural falling of mites, but it is easier to apply. The major disadvantage is the necessity having drone brood within the bee family.

Period	**Percentage of pups infested with varroa[38]**		
March, April, May	≤ 2% No measure required	2%-4% Treatments may be applied: - biotechnological methods or acaricides	≥ 4% Compulsory acaricide treatments completed by alternative methods
June **July**	≤ 3% No measure required	3%-7% Treatments may be applied: - biotechnological methods or acaricides	≥7 % Compulsory acaricide treatments completed by alternative methods
August	≤ 5% No measure required	5%-10% Treatments may be applied: - biotechnological methods or acaricides	≥10 % Compulsory acaricide treatments completed by alternative methods

The prophylaxis measures applied both by the beekeeper and by the veterinary recommendations *shall consist of*:

• avoidance of contamination routes for healthy bee families (disease-free);
• evaluation of all potential risk factors. The appearance of infection in a bee family happens mainly by transmitting the parasite from a parasitic bee family with destructive Varroa to the disease-free family.

For monitoring a bee family with specialized organisms, it is mandatory to collect 50-100 bees/sample and drone brood comb of 20 cm2/sample in the period from March to October (active season).
The samples of bees and honeycomb shall be properly packed and accompanied by a note with the following data: name of the apiary, name of the beekeeper, exact address, number of bee families in the apiary and other relevant data related to the apiary.
Sampling shall be carried out by the free-practice veterinary and the official veterinarian of the veterinary department who sends the samples to an authorized specialized laboratory.

Active monitoring of the apiary consists of:

1. Clinical and pathological surveillance of worker bees, mosquitoes and capped brood in the period March to October;
2. Monitoring by laboratory examination and, if necessary, full laboratory diagnosis by means of:

[38] Managing varroa, The Food and Environment Research Agency, 2010

Laboratory examinations from 25 g/sample living bees and whole honeycomb material or 20 cm2 portions/sample, honeycomb with capped drone brood and/or working bee.

Measures to combat varroosis:

- purchasing medicines and/or anti-varroa bottom hives for *conventional beekeeping*;
- administration and purchase of drugs listed in the list of products approved by the Institute for the Control of Biological products and Veterinary medicinal products (Romania)
- the use of varroa control bottoms with the following characteristics: the entire surface under the frames must be covered with a wire mesh and a drawer must be placed under the wire mesh to allow the examination of the fallen parasites of the bee family on it;
- anti-varroa treatments must be carried out based on a schedule drawn up annually by the beekeeper, approved and followed by the representatives of the veterinary authority.

Both Romania and Bulgaria benefit from the Beekeeping Programs for 2020-2022, approved by the EU implementing decision 2019/974 in all EU countries, so that "combating hive invaders and diseases, especially varroosis" is among the 8 specific funding measures.[39]

The controlling methods currently available at national and international level are:

1. **Chemical methods (acaricides)**
2. **Alternative methods (beekeeping management or biotechnology)**

Methods	**Advantages**	**Disadvantages**
Biotechnological (alternative): 1. the elimination of drone brood 2. the use of trap combs 3. using the anti-varroa bottom 4. the use of heat treatment devices 5. production of improved bee with increased natural resistance to diseases	They are not harmful (no chemicals). They are not expensive	May be time consuming Require skill/specialization. They are not sufficient if used alone
Approved acaricides	Have proven efficiency Proven security for bees Easy to apply	Mites develop resistance They lead to residues in apiculture products I can be expensive

Since there are pros and cons for the two types of methods, it is considered that to increase efficiency and mitigate some shortcomings, they can be used in parallel in an alternative scheme depending on the practice and skill of the beekeeper, the climatic conditions, the infestation level and other specific factors, to create premises for good apiculture practices.

Thus, the best results in the beekeeping practice are obtained by combining these methods according to the time of the year and the level of infestation with varroosis: < integrated varroosis management system> or <integrated varroosis control system>.

[39] https://ec.europa.eu/info/food-farming-fisheries/animals-and-animal-products/animal-products/honey_en

Romania

Guidance scheme for the administration of ICDA medicinal products:

- stimulating the development of bee families, increasing resistance and immunity of bee families by administrating *Protofil* depending on the strength of the family (according to leaflet specifications), spring (in syrup 17 ml/L syrup up to 50-70 ml/family), autumn (in syrup 17 ml/L syrup up to 50-70 ml/family) or winter (34 ml/kg cake up to 50-70 ml/family) - (one ***Protofil* bottle/7 families**),
- administration of CONCENTRATED-VARACHET (according to the leaflet specifications) is done to all bee families in the apiary (1 box/60 bee families/treatment);
    - *the first treatment shall be carried out in spring (*when the environment temperature is above 12 °C), before placing the bodies for production harvest, repeating it at 7-10 days;
    - *a second treatment shall be carried out in August* after harvesting honey for selling purpose, and repeating it at 7-10 days;
    - *a third treatment is carried out in the autumn* (October to November), repeating it at 7-10 days, the last being in the total absence of brood (when the environment temperature is above 12-14 °C)
    - *the administration of MAVRIROL* is done in autumn (September) when it is recommended to introduce the Mavriol bands and it is left in the hive for 45 days (1 box/5 bee families);
- throughout the period, bottom hives are used for (anti-varroa) control (**1 anti-varroa bottom/family).**[40]

Bulgaria

Methods used in Bulgaria[41]

Brood colonies

Apilife Var – evaporation tablets with thymol, eucalyptus, camphor, and menthol (Chemical Life, Italy)

- a small dose: 1 tablet broken into 3-4 pieces placed on the on the slat that holds the honeycomb, 3-4 times after 7-8 days
- a large dose: high dose: 2 tablets broken in 2-3 pieces for 12 times, then repeat the administration one time.

Ecostop (boards) (with thymol and Menthae oil) (Primavet-Sofia, Ltd)

- 1-3 plates on the upper side of brood frames

Apiquard (with Thymol) - Vita (Europa) Ltd

- It is placed in the upper side of the brood frame

[40] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 98, 2011

[41] Treatments of Bee Diseases in Bulgarian Organic, Beekeeping, Dinko Dinkov, Parvan Parvanov, Trakia University Faculty of Veterinary Medicine, Bulgaria, 2010

- After 2 weeks the 2nd tray is placed;
- Last treatment is applied after 4-6 weeks

Thymol (powder crystals)

- It evaporates by being placed in special frames

Formic acid - 60% steam

- absorbent pads (40 ml 60% formic acid) or mite-away gel packs

Colonies lacking brood

Oxalic acid - spray, drops or evaporation methods

Moldova[42]

Other former treatments used to control varroa

1. Formic acid

Dose per family with 10 bee intervals – 30 ml,
Concentration: 85% or 60% depending on outdoor temperatures and absorber positioning (top -60%, bottom -85%).
It is used in gel form (Formisan) or on an sanitary pad support.
Optimal temperature for treatment 14-25 °C (during the first 6 hours after application)
Multiple researches show that the most effective location is placing the 85% formic acid sanitary pad under the frames. Thus, the air cushion between the frames and the bottom hives reduces the stress caused by the acid to the bee. It is recommended to apply formic acid treatment in spring and autumn.

Note:

- The treatment with formic acid is a **shock treatment**.
- Placing the sanitary pad near the brood can cause disorder in its growth, or worse, its removal from the hive.
- The use of acid at other temperatures than those prescribed (14-25 °C) may result in the following harmful effects:
    - Generating chaos in the family;
    - leaving the nest;
    - brood getting cold;
    - the worse that can happen – it can lead to loss of the queen.

2. Oxalic acid

Application methods

a. Dripping method;

[42] Treatments used against Varroa, Sacara Petru, beekeeper

Recipe
35 g oxalic acid,
1000 ml water (herbal tea + sugar),
5 ml per bee interval
Maximum efficiency –53-90% (no presence of bee brood)
Disadvantages
The nest is very disturbed (this treatment is carried out at temperatures between 5 and -5 °C – when the cluster) is already formed);
An insignificant number of dead bees are observed after this treatment.
For one generation of bees, treatment is applied only once

b. The spraying method.

Recipe
30 gr of oxalic acid;
1000 ml water (herbal tea + sugar);
10 ml per frame;
Maximum efficiency –80-90% (when it is done without bee brood presence).
Disadvantages
Opening the nest in cold weather
Time consuming.
There are cases when queen falls.
An insignificant number of dead bees are observed after this treatment.

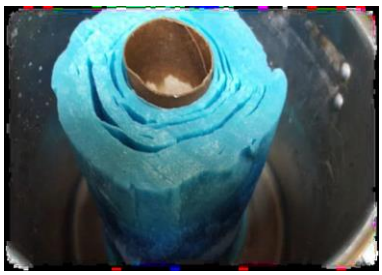
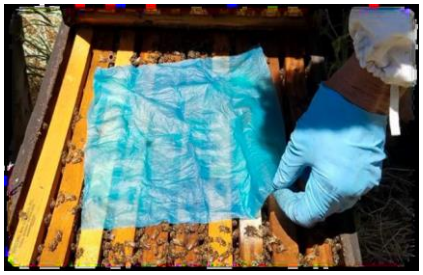
c. "Oxalic acid" method + glycerine";

Recipe (pe 1 hive)
12 gr de acid oxalic.
10 ml water
13 ml glycerine.
It is one of the methods that has **a longer influence on varroa**.
It has a certain level a **popularity in USA and Canada** (described and used by some beekeepers and researchers)
By using this method**, Varroa can be controlled in June-July period**, when it has the best conditions to develop.
Advantages
It allows acarian control for longer periods of time;
Multiple use throughout the year is possible.

Preparation steps
1. Oxalic acid is placed in a stainless-steel bowl.
2. Similarly, place 1 roll of paper (table wipes 24/23) in a stainless-steel bowl.
3. Pour hot water over the acid and mix until the acid melts.
4. Then pour the glycerine and mix thoroughly.
5. The solution obtained is poured over paper roll. Absorption takes place for 2 min.
6. Take out the roll and place it on a tray – this way extra liquid shall drain

To prevent crystallization of the acid before it has been thoroughly absorbed, the solution poured over the roll as well as the paper roll should be 43-44 ° C
Do not boil the solution!

Use and effect of the solution
1. For each family, place a napkin between the storeys;
2. For 20 days, this will be removed from bee hive;
3. During the process of fragmentation and removal of the tissue soaked with crystallized oxalic acid from hive, the acid crystals are spread by the bees and it acts against the mites.


d. Sublimation method.

It is an old method, but it has been extensively investigated in recent years:

- 95 beekeepers - researchers from 7 countries.
- Sample: 1509 families.
- Comparative analyses with other treatments, such as Amitraz.

Recipe and use (per 1 hive)
2,2 g / family
Constant temperature: 189 °C
Application time per family: 30-35 seconds.
Advantages
Bio treatments.
It allows treatment of bees several times in the presence of bee brood and honey.
It doesn't require the disturbance of the family during cold season.
No dead bees are to be observed as opposed to the dripping method.
High efficiency method destroys 95-98% of mites from bees.
Some research show that in spring, families treated by way of the sublimation method have by **10% more bee brood surface**, as compared with families treated with the dripping method or pulverization method.
Strong influence on mites –4-7 days, then the number of mites decreases (up to the 14th day after treatment).

The spread of varroosis (parasitic diseases) is determined by favoring factors such as:

- increasing the number of bee families on a small area with transmission from one apiary to another;
- practice of pastoral beekeeping and temporary crowding the apiary near other apiaries with

unknown epidemiological situations.

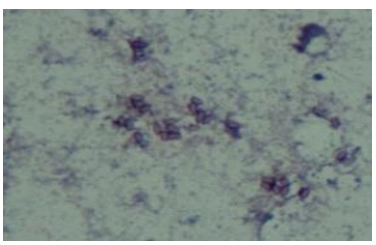
- *failure to adequately perform treatments with medicines that are mentioned on ICBMV list.*
- *non-complying with the medication instructions as per the drug package leaflet*.

Recommendations to avoid the risk of varroosis in areas that are disease free:

- application of the veterinary legislation in force on monitoring parasite diseases in bees.
- active monitoring of the disease by*:*
  - *A clinical and pathological monitoring of bee brood and*
  - *Monitoring through lab exams and*, if necessary, **full laboratory diagnosis**;
- *Import - the Approved Veterinary Authority must apply for an international veterinary certificate that establishes whether it comes from a country free of varroosis.*

4.2 Methods and procedures for American foulbrood control

American foulbrood is a bacterial disease present in almost all countries, being the most devastating disease affecting the larvae stage of *Apis mellifera* bees and other *Apis* species.
American foulbrood affects the bee brood determining its death in the stage of capped brood. It can easily spread from one apiary to another or from one bee family to another. The pathogen is Bacillus larvae. This disease is much more active in July-August.
The disease spreads through thief bees, drones, bee drinkers, infected honey, parasites of the hive such bee wax moth; as well as through biological material (families, swarm of bees, queens from contaminated hives).
American foulbrood does not cure itself, unless there are measures in place, it can affect all bee families, which will lead to their death by the end of the summer.
The geographical origin of American foulbrood is not known but in Romania it was declared for the first time in 1924. In Romania, annually, American foulbrood incidence has registered an increase, thus health monitoring, prevention of diseases in bee families, as well as the quality and safety of apiculture products are a permanent concern of veterinary services.
The American foulbrood is still a major cause of economic losses for beekeepers. Subclinical infections are common and require laboratory diagnosis. The incubation period for American foulbrood is of 15 days.
The disease can be recognized as follows: the cells have perforated, excavated caps, dark brown to black in color, under which, the residue of larvae of chocolate color can be found sticking to the walls of the cell. If an attempt is made to extract the contents, the contents will be stretched out in the form of a filament (the matchstick sample).

	
Photo. Larvae affected by American foulbrood with viscous appearance	Photo. Spores of Paenibacillus larvae — CollGram

A characteristic rotting smell from the American foulbrood persists in the hive. In the advanced stage of the affected cells, the dead larvae are completely dehydrated and take the aspect of detritus dark-brown or black in colour.
The diagnosis shall be pronounced based on clinical signs and established in the laboratory on honeycomb samples with the suspect brood. The sample will be at least 15/10 cm in size. Other examinations will also be carried out in the laboratory for the differential diagnosis from the European foulbrood, sacbrood and bee viruses.
In case of American foulbrood confirmation, it is required to destroy all bee families affected by the disease and to perform a rigorous disinfection of beekeeping material.
Prophylaxis measures consist of:[43]

- avoiding contamination risks for the bee family colonies (disease-free);
- evaluation of all potential risk factors. Infection in a bee family can occur through different way of transmission:
  - Use of contaminated equipment.
  - Change of infected material between apiaries.
  - Feeding bees with contaminated honey and pollen.
- Bee thieves that transfer a large quantity of spores from sick and weak colonies to healthy colonies, etc.

  Samples are taken by the free practice *veterinarian* and the official veterinarian of the veterinary department and sent to a specialized laboratory for the purpose of surveillance of the apiary (**for monitoring** – direct anatomic-pathologic and microscopic examination (bacterioscopic); **for diagnosis —** bacteriological and conventional PCR examination. The samples for laboratory examinations consist of entire combs or portions of 20 cm^2/sample, captive queen cells. Entire honeycombs can also contain food reserves (capped honey). Honeycombs are packed accordingly and will have attached the following information: name of the hives, name of the beekeeper, exact address, number of bee families in the hives and other data related to the hive of origin.

Disinfection measures

Independently of the control method used, at the end of the hygiene process, there is always disinfection. This is as important as disease control itself. If there are mistakes in this process or if there is no thoroughness in this process, problems may reoccur.
The disinfection of hives shall be carried out only when they are in good condition. For old and damaged hives, it is better for them to be burned. Disinfection should preferably be done by flaming parts of wood.
First of all, however, everything must be cleaned perfectly whereas the traces of wax and propolis must be scrapped. Using this method cannot eliminate all spores, but their number will be substantially reduced. The few spores that are left cannot reinfect the colony. Based on experience and practice, it does not seem necessary to wash hives beforehand with sodium solution. Tool such as the beekeeper's chisel, feeding trays and the honey impeller, but also plastic hives will be washed with warm sodium solution in concentration of 3% to 5 %. Finally, these must be cleansed with clean water. Preferably,

[43] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 100, 2011

the bee brush or the flakes will be burnt. In the event of severe epidemic, it is necessary to consistently clean the pavilion. Wooden parts can be treated with flame.
The spare honeycombs cabinets should be very well disinfected. The parts that cannot be flamed should be cleaned with warm sodium solution in concentration of 3-5%. For hives placed in nature work is consistently reduced, expenses are lower, however honeycombs support should not be overseen. In the scientific literature, several methods of disinfection are described. Majority of them are not applicable in small and medium size enterprises or danger for the user is too high. The hygiene process of the apiary will always include the spare honeycombs as well. This is distressing for the beekeepers as it is very difficult to replace them in such a short period of time.
No matter if only one or several colonies are infested, honeycombs must be destroyed with no exception, because only in exceptional cases they will be redistributed to other colonies. Wooden frames of honeycombs could be disinfected by flaming.
However, expenses are much higher than the value of the material. In addition, the disinfection of the frames rarely succeeds. Bee wax combs can be delivered to a wax factory that has wax heating installations at a temperature above 100° C with steam pressure.
For the transport, honeycombs are packed in plastic bags, that must be labelled „contaminated wax". The presented procedure has the disadvantage that plastic bags can be easily broken and the leaked honey can infect other bee colonies.
For this reason, it is better to burn out the frames together with the dead bees in pit dug beforehand, however in case of burning, the law of emission control should be considered. If honeycombs still contain honey, it can be decided to centrifugate them before burning. Since danger of theft is high it is recommended for the centrifugation to be performed at night if there is no room free of bees. The honey will be used only for human use not as food for bees, because only through an extreme heating the spores can be destroyed.
Measures to control[44] the American foulbrood consist in avoiding the favourable factors that can determine the occurrence of the disease. The spread of bacterial diseases in Romania (American foulbrood) is determined by favourable factors, such as:

- Increase of bee colonies on a small surface with apiary-to-apiary transmission.
- Practicing the pastoral beekeeping and temporary crowding of apiary near to other apiaries with unknown epidemiologic situation.
- Excluding the use of some medicine such as antibiotics, oxytetracycline and erythromycin used in the control of this disease, because they leave residues in honey.
- Not complying with compulsory hygiene measures and of imposed sanitary measures (equipment that comes from infected apiary must be disinfected, sterilized, or destroyed).
- *The lack of information* program for beekeepers to encourage the report all clinical cases of American foulbrood.
- *Not destroying by burning the bee families that were confirmed with American foulbrood.*

Recommendations to avoid risks of American foulbrood in disease-free areas:

- *disinfection* and maintaining an adequate hygiene of apiary inventory (basic tools, necessary inventory for the handling and care of bee families, inventory for frames wiring and artificial frames attachment, inventory for honey conditioning, inventory for wax extraction and

[44] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 100, 2011

conditioning, diverse beekeeping inventory, household inventory, other supply inventory);

- application of the veterinary legislation in force on the monitoring of contagious or infectious diseases with bees);
- clinical monitoring and pathological monitoring of captive brood, in April-September at least for: a) 15 % of the apiary colonies of "queen nurseries"; b) 5% of the production colony apiaries c) in spring, after the winter season and in autumn after pastoral beekeeping; d) when changing the hearth of the apiary;
- compulsory notification of disease presence in accordance with the legal provisions;
- the import of bee biological material should come only from a country free of American foulbrood;
- an area is considered American foulbrood-free if 5 after years the last isolation, in the annual monitoring surveys carried out by the veterinary authority, the samples show negative results on the etiological agents producing the disease.
- the competent veterinary authority for monitoring bee health must carry out disease control on bees in order to have a record on the status of all hives in the country;
- control and monitoring of American foulbrood can be carried out by clinical and laboratory investigations within approved laboratories.
- the outbreaks detected by American foulbrood may be confirmed in Romania at the National Reference Laboratory, IDSA Bucharest through PCR (bee samples with or without specific clinical symptoms of pathology, bacterial culture samples, larvae, honey) and rapid immunochromatographic kit (larvae samples).
- American foulbrood is a disease that must be declared, it is subject to laboratory and quarantine investigations in the respective zone/ country.

Bulgaria[45]

Preventive measures used in Bulgaria

- Quick Diagnostic tests - Vita (Europe) Ltd confirmed by laboratory
- Destroying the sick bee families (burning)
- Transfer of bees in new hives with new honeycombs
- Hive disinfection with NaOH solutions followed by an organic acid neutralization
- Equipment should be sunk in 0,5% hypochlorite solution for 20 minutes.
- Beekeeper's hands should be disinfected before and after working at sick hives
- Clothing must be boiled in water.
- Laboratory control (1 year quarantine in apiary after the last positive sample)

4.3 Methods and procedures for Nosema control[46]

Nosemosis **(i.e. previously)** – „poverty disease", is a parasitic disease (caused by Nosema apis) that occurs due to the existence of favorable factors in the hive:

[45] Treatments of Bee Diseases in Bulgarian Organic, Beekeeping, Dinko Dinkov, Parvan Parvanov, Trakia University Faculty of Veterinary Medicine, Bulgaria, 2010
[46] http://www.miere-bucovina.ro/nosemoza.html

- Lack of bee cleaning flights during winter.
- Food reserve of low quality (uncapped manna honey);
- improper protein additions.
- no cleaning and no disinfection of hives;
- high level of humidity;
- difficult and uncomfortable winter.

The disease is caused by a protozoan that is to be found in latent state in hives that it gets activated in favorable conditions.

Clinical manifestation

In an incipient infestation stage, the clinical signs are hidden and visible only when the load of parasites per individual reaches a certain limit.

Nosema that it is not treated at the right time shortens the life of bees, drastically reduces the production capacity in the end it can lead to definitive disappearance of family through rapid death.

Clinical signs:

- premature bee wear, depopulation of hive;
- drops of diarrhoea on the back, combs, walls and bottom of the hives;
- brown diarrheal excrement with a bad, sour smell, laid as a jet during the cleaning the flight and observed on the flight board, the cap and front of the hive;
- the bees have their abdomen relaxed and soft and move with difficulty;
- bees have extended wings, legs gathered under the chest, they paralyze and die.

Diagnostic

Because this clinical manifestation is noticeable in other diseases (see diarrhoea).

Placing a certain diagnostic is more complicated, being necessary to have samples examined by a specialized laboratory.

When disease is in advanced stage and beekeeper can have a correct diagnosis by examining few dead bees.

Proceed as follows: take the bee, separate head from body using a tweezer, intestines are taken out. When the bee is healthy, the colour of the intestine is yellow or brown, while with the sick bee, the colour is milky-white.

Prevention and control of Nosema

- Replacing honeycombs in the hive every 2-3 years.
- Destroying old honeycombs or those containing diarrhoea marks with new ones.
- Old frames that can no longer be adequately disinfected, are destroyed;
- Periodical collection of all scrap from hive and their immediate burn;
- In families that have Nosema all queens are replaced, no matter the age and qualities;
- Annual cleaning of hive with sodium hydroxide 4% (preventively), or as many times as necessary (after noticing the disease).
- For metallic installation and tools, fumigations are made with 3% formol; these types of disinfections will be followed by consistent washing.
- Constant monitoring of families and adequate measures activation without delay;

- Protein food administration in spring is to be used with caution (pollen adding and bee bread in honey) and prohibition to use honey and pollen substitutes.

Treatment

Romania

PROTOFIL

In Romania, this disease is treated with „Protofil". It is an extract of natural ingredients which does not cause any damage to bees or hives. The content of active principles (vitamins and microelements) stimulates the enzymatic digestive secretion of bees and larvae, by inhibiting the parasites.

Aministration method:

Protofil is administrated 17ml/l in syrup or in sugar paste, honey and sugar, 34ml/kg. It is administrated in autumn in syrup for stimulation or as complementary food, or in spring in sugar paste or syrup for simulation.

Treatment is applied every time it is necessary, on one condition: the dose of Potofil quantity cannot exceed 80 ml / family/ year. For a complete success, read the manufacturer's leaflet carefully and follow the administration doses.

FUMIDIL B

It is another product, older, imported and unfortunately not used as much used by Romanian beekeepers. In EU countries, it is the only product used for curing Nosema. As an active principle, Fumidil B has in its composition the fumagillin antibiotic.

Administration:

It is administrated in a mixed in syrup as follows: on a large colony, 25 g active principle per 1 liter of syrup, for an average colony of 18 g / 0,750 liters of syrup and for a bee swarm, 18 g / 0,500 liters of syrup. These quantities shall be administered weekly.

There are two types of administration :

- in the bee food, with the product inserted on the feeding tray;
- by spraying on frames and on the walls of hive, while the remaining syrup is administrated as food.

As a total, it is administrated 8 times every 7 days. The treatment requires time, and by the fact that the active principle is an antibiotic, there is a risk of honey contamination if its administration is performed in the full working season. High caution is recommended.

Unconventional treatment

Some Romanian beekeepers use herbal tea (thyme, yarrow etc) to which a small quantity of garlic is added. Ingredients are mixed with 750 g sugar syrup and it is feed to the bees in 200 g portions. Results are satisfying.

Bulgaria[47]

Control methods used in Bulgaria:

- hives and other tools made of wood or metal (impeller, equipment etc.), are disinfected with NaOH 2% solution;
- the beekeeper's hands must be disinfected before and after working with sick hives;
- clothing must be boiled in water;
- the treatment with Nosestat ("Primavet – Sofia", Ltd.), (iodine, potassium iodide and formic acid) showed a high level of efficiency – treatments with sugar solution 3 times every 3 days and the treatment scheme is to be repeated after 7 days;
- plant extracts which are safe for the environment and non-toxic to humans – "ApiHerb", Chemical Life, Italia – feeding with sugar solution for 3 weeks.
- the absence of the parasite agent in the disinfected hive must be proved by laboratory analysis.

4.4 Medicines and bio stimulants for apicultural use

Control disease measures (specific measures)

The control of diseases in bees is carried out through medicinal treatments and by other medical means.

Romania

The following medicinal products for the disease control in the field of beekeeping are listed with the *Institute for the Control of Biological products and Veterinary medicinal products / 2020:*

Product name	Certificate no.	Date of validation	Producer	Authorization status
Bayvarol strip	120198	30/05/2012	Bayer Animal Health GmbH	Valid
Checkmite+	120242	17/07/2012	Bayer Animal Health GmbH	Valid
Varachet forte	120281	31/10/2012	I.C.D. Apicultura Bucuresti	Valid
Mavrirol	120282	31/10/2012	I.C.D. Apicultura Bucuresti	Valid
Thymovar	140043	18/02/2014	Andermatt BioVet GmbH	Valid
Api life var	160145	17/05/2016	Chemicals Laif S.p.A.	Valid
Protofil	160442	19/12/2016	I.C.D. Apicultura Bucuresti	Valid
PolyVar Yellow 275 mg	170056	09/02/2017	Bayer Animal Health GmbH	Valid
API-Bioxal	170125	09/05/2017	Chemicals Laif S.p.A.	Valid
Varatraz	80095	20/06/2018	Pasteur Filipești Branch	Valid
MAQS Acid formic 68,2 g	190074	18/04/2019	NOD Apiary Ireland Ltd.	Valid
Apiguard Gel 25%	190072	08/04/2019	Vita Bee Health Ltd.	Valid
Apivar 500 mg	190249	10/10/2019	Veto Pharma SAS	Valid
Varostop strips	190328	18/12/2019	Pamas Trading SRL	Valid

[47] Treatments of Bee Diseases in Bulgarian Organic, Beekeeping, Dinko Dinkov, Parvan Parvanov, Trakia University Faculty of Veterinary Medicine, Bulgaria, 2010

Bio-stimulators: APINUTRIENT and APICOMPLEX produced by I.C.D. Apiculture București.
The current trend for treating and fighting bee diseases refers to the use of medicinal plants in controlling bee diseases, strengthening the natural resistance of the bee family and restricting the use of drugs in combating etiological agents.
*Other drugs that are marketed i*n Romania but that are currently not listed on the valid list of ICBMV: ECOSTOP (flumethrin), VAROSTOP (flumethrin), THYMOVAR (thymol), VAROTOM (flumethrin), APISTAN (taufluvalinat) etc.[48]

Bulgaria[49]
Drugs for bee disease control:

No	Name	Producer	Treatment
1	„Apilife Var – evaporation tablets"	Chemical Life, Italia),	Varroa
2	Ecostop (plates) (With thymol and Menthae oil)	Primavet-Sofia, Ltd	Varroa
3	Apiquard (with thymol)	Vita (Europa) LTD	Varroa
4	Nosestat	Primavet-Sofia, Ltd	Nosema
5	Apiherb	Chemical Life, Italia)	Nosema
6	B401 (Bacillus thuringensis)	Vita (Europa) LTD	Big/small mite of beeswax

Turkey
Administration of synthetic chemicals has been banned by organic farming regulations, due to the remaining residues in bee products, but many beekeepers use organic or homeopathic treatments to combat these diseases. According to the rules on organic beekeeping, the following can be used in the varroa treatment: formic acid, lactic acid, oxalic acid, menthol, camphor okaliptol and thymol oil.
Natural products and pharmaceuticals that are used against diseases and pests in Turkey are:

No	Name	Treatment
1	Fumidil B	Nosema
2	Apimicin	Nosema
3	Teramicin	American and European foulbrood
4	Neoteramicin	American foulbrood
5	Mavrick	Varroa
6	Varroset	Varroa
8	Formic Acid	Varroa
9	Oxalic Acid	Varroa
11	Rulamid	Varroa
12	Thyme	Varroa
13	Laruel	Varroa

[48] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 107, 2011
[49] Treatments of Bee Diseases in Bulgarian Organic, Beekeeping, Dinko Dinkov, Parvan Parvanov, Trakia University Faculty of Veterinary Medicine, Bulgaria, 2010

Other products that are used are Vitamix and Biovenol.[50]

Ukraine[51]

Treatment for Varroa control in an organic apiary has the following scheme:

- in spring (three weeks before harvesting) beekeepers use oxalic or formic acid, thymol for diagnostic and control treatments;
- in summer, after the honey was extracted in August, all beekeepers treat the bee family with oxalic acid;
- in spring and summer, beekeepers use special dried herbs that have acaricide action against Varroa: Thyme (Thymus serpillum), white wormwood (Artemisia absinthima), eucalipt oil, Siberian fir oil (Abies sibirica), garlic extract, etc.

For Varrora control, Apitotus oil is used. This is a natural complex of polypeptides, amonoacids, microelements, fat acids (Omega-3, Omega-6) that increse the lysozyme activity of the Royal Jelly also in haemolymph of the adult larvae and bees, phagocytosis activity of the hemocytes and integral development of bee family;
Apitotus is used during autumn as mesures against bee lose and against the negative influence of the Varroa on bee family during winter.

Moldova

No	Treatment	Name
1	Acaricide products against Varroa	Melisan Bipin-M Apimol Apidez (plăci) Fluvalidez (plăci) Amipol T
2	Acaricide products against Varroosis and acariosis	Varrosan Formisan
3	Treatment against Nosema	Apimol +
4	Products for infectious disease and parasites	AntiVarNosem
5	Stimulus and development of the bee family	Melestim Apifor

Drug treatments are accompanied by disinfection measures and the following:[52]

- sanitary inspection for the entire bee population by the veterinary for all bee families during March-April and August-September;

[50] http://liveandletbee.org/wp-content/uploads/2018/01/Beekeeping-in-Turkey.pdf
[51] Organic beekeeping in Ukraine, Evgeny Rudenko, Institute of Animal Science, Kharkov, Ukraine
[52] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, page 108, 2011

- performing control treatments for ectoparasites;
- treatment measures for all sick families and prevention measures against disease spreading to other bee families within the apiary, according to the sanitary and veterinary law in force;
- destruction of the bee families affected by bacterial diseases by burning (American foulbrood, European foulbrood);
- bee families with clinical signs of infectious-contagious diseases cannot be transferred to pastoral beekeeping unless they are healed and healthy; apiaries infected with infectious or parasitic diseases subject to the compulsory declaration cannot practice pastoral beekeeping;
- interdiction to sell contaminated or parasite infested biological material;
- when placing the hives, one must consider giving proper orientation marks to avoid loss of bees (they are not to be placed near GSM antennas or high voltage lines, electrical transformers);
- prevention of theft by avoiding work on bee families during daytime;
- application of the prescribed medicinal treatments and hygiene measures are to be associated with a set of biological measures related to the preservation of the bee health;
- the current trend refers to the use of medicinal plants in the control of diseases in bees, strengthening the natural resistance of the bee family and restriction of the use of drug products for the control of etiological agents;
- prevention of intoxication in bees is done by measures to protect bee families from pesticide poisoning.
- maintaining a good health for the bee families by carrying out regular veterinary checks through laboratory examinations for internally notified diseases.
- for selection apiaries and selling of biological material (swarms, queen bees) it is recommended to have the veterinary health check of the biological material put on sale and also their reproductive parameters (selection apiaries);
- there should be an apiary registry (apiary book) to mention the technological stages and performed treatments recorded.

4.5. Methods and procedures for pest control[53]

Apart from diseases that threaten their lives, bees also have many enemies among animals or plants. These are as dangerous because they attack both adult bees as well as bee brood, eating honey collected in honeycombs or destroying wax honeycombs in search for pollen. Equilibrium between species in nature is maintained based on a harsh law, yet necessary, by which all beings have enemies that threaten their health, limiting their multiplication. Bees are no exception since there are many species that are attracted by the sweetness of the bee honey. There are many zoological species able to *disrupt vital family processes*, such as parasites, predators, disruptors, or residue eaters. Bee pests are: insects, birds, frogs, reptiles, superior or inferior mammals and harmful plants.

[53] Best Practice Guide for Beekeeping, Romanian Beekeepers Association, pages 109-113, 2011

4.5.1. Insects

Galeriosis (wax moth)

Etiology

The wax moth is a parasite insect of beehives, it is spread across all countries. It is very dangerous and harmful as it can destroy in a short time all the honeycomb equipment in storage. This parasite insect belongs to the *Pyralidae family, Galleriinae sub-family*, represented by two species: *Galleria mellonela* (big Galeriosis butterfly) and *Achroea grisella* (small Galeriosis butterfly) (photo 1), the last one producing less damage in apiculture.

	
Photo . big Galeriosis butterfly (left) and small Galeriosis butterfly (right)	Photo. Honeycombs with galleries dug by *Galleria* larvae

Recommendations for prevention and control of the wax moth

Prevention measures

a) Prevention methods in bee family

To prevent the occurrence of Galeriosis in the bee family, the following prevention methods are recommended:

- maintaining strong families in the hives, with sufficient and good quality food, with the nest reduced so that all the honeycomb is covered with bees;
- *compulsory periodic cleaning* of hives of accumulated residue, on their bottom;
- preventing occurrence of Galeriosis in the honeycombs storage is achieved by treating them with Sulphur dioxide, in air-tight sealed spaces.
- sulfur dioxide can be released by combustion, evaporation of the liquid solution or using pressurized vessels. Because sulfur dioxide does not kill, eggs the treatment should be repeated every 2-3 weeks.
- the use of chemicals such as: naphthalene, carbon sulfide, methyl bromide, paradichlorobenzene, etc. is no longer recommended, because they leave residues in honey and hive products which can affect the health of consumers.

b) Prevention methods in deposits with spare honeycombs

To prevent Galeriosis in reserve honeycombs storage, the following measures are recommended:

- rooms where the honeycombs are stored must be annually cleaned, disinfected and also aired;

- their windows shall be fitted with screens with a mesh size less than 1 mm*;*
- *the cabinets* in which honeycombs are stored must have be perfectly sealed;
- *Annual reformation:* 1/3 of the old honeycombs that can carry pathological germs and wax moth eggs.
- in weaker colonies that require stimulation, it is not recommended to use honeycombs from the storage which might be infected with wax moth eggs.

Control Measures

a) Measures taken in case of necessity in an apiary

Once the bee family was affected by the wax moth, it no longer can defend herself but can be helped to do so through several methods:

- *hives* must be constantly verified;
- *honeycombs that are seriously affected* must be removed;
- with honeycombs that are less affected, galleries are to be opened with a sharp instrument, larvae are removed manually, webs and cocoons of parasites as well, larvae are destroyed so that bees can clean and restore the damaged cells.
- the use of light, glue and attractant traps in order to attract and capture adults (traditional method);
- *the use of* electric devices against insects that operate through ultraviolet light (as a nonpolluting device)

b) Prevention methods in case of necessity in deposits with spare honeycombs

In the storages with spare honeycombs, the following measures are to be taken:

- affected combs are to be removed and the rest of the combs need disinfection with sulfur dioxide or with glacial acetic acid;
- a heat treatment of combs should be performed by freezing, in refrigerating boxes, even in summer, for about 3 hours, to destroy larvae and eggs; freezing is not recommended for combs filled with honey;
- for combs that are stored from autumn to spring, it is compulsory to have a thermic treatment applied by freezing;
- destruction of the wax moth that is in the apiary storage combs is conducted by using treatment with Sulphur dioxide in air-tight sealed spaces. Sulfur dioxide may be released by combustion, evaporation of the liquid solution or using pressure vessels. Since sulfur dioxide does not kill eggs, the treatment should be repeated every 2-3 weeks; Glacial acetic acid can be used in air-tight sealed rooms to treat the spare combs. If treatment is applied in autumn, combs may be kept as such until spring. Before use, they should be kept in open air spaces.

Bulgaria[54]

Measures taken to control insects:

• storing the comb at freezing temperature could prevent this disease because freezing kills the eggs and larvae of the wax moth.

[54] Treatments of Bee Diseases in Bulgarian Organic, Beekeeping, Dinko Dinkov, Parvan Parvanov, Trakia University Faculty of Veterinary Medicine, Bulgaria, 2010

• treatment with B401 (Bacillus thuringensis) - Vita (Europe) Ltd (www.vitaeurope.com) - diluted with water to 5% (1 vol B401 for 19 vol water)

The Philanthus (Beewolf)

The Beewolf (*Philanthus triangulum L.*) is a harmful hymenopter that resemble wasps, considered to be a harmful insect especially for larvae, that develop in the cells of bee brood and destroys it. It attacks bees on the beehive, while flying or on flowers, it fixes them well between the legs, it eats some of them, and with others it feeds its larvae in the nest.

Photo. The Philanthus (Beewolf) - (*Philanthus Triangulum*)

Recommendations for control*:*

- it is forbidden to use any chemical substances.
- changing the apiary placement where it is possible.

Ants

Ants (hymenopter from *Formicidae family,* ***Fomica*** **sp.**) are considered harmful insects for bees, because they enter the hive at sunset, invading honeycombs and bee combs, and especially worker bees, that come back from harvesting and fall on bee entrance (photo2).

Photo. Ants (*Formica sp*.)

Recommendations for control:

- it is not recommended to use powder insecticides or pesticide;
- traditional methods:
  - it is recommended to use engine grease or oil products (diesel fuel, fuel oil, burnt engine oil) introduced in metallic recipients (cans or other similar recipients) that will be placed at the hives legs during the active period of these pests;
  - the grass around hives should be mowed to prevent ants from climbing onto the hive;
  - placing hives at appropriate height from the ground to avoid climbing 30 cm above the

ground;

- also, wormwood or parsley leaves maybe placed at the feet of the hive because they have an ant killer effect.

4.5.2. Birds

The European bee eater (*Merops apiaster* L.)

The bee eater is an insectivorous bird that winters in warm countries and it is distinguished by a very beautiful color of plumage.

Photo. Bee eater (*Merops apiaster*) attacking a bee

Attacks are more intense in June, when their chicks are growing and in August when they prepare to emigrate towards warm countries. A bee eater can eat during one day up to 30-100 bees usually at sunset or when the sky is overcast. Sometimes queens can be hunted by these birds when they come out for mating.

Recommendations for its control:

- traditional method – removal of the bee eater by using recorded sounds similar to their own;
- the use of ultrasound devices that remove the birds from the area they are placed in;
- using a mesh trap for rats (during winter);
- pesticide substances cannot be used.

Woodpecker (*Picus sp.)*

By its way of life, the woodpecker makes an important contribution to combating pests in forests and orchards with fruit trees. Due to its fine hearing, it manages to detect tree bark and xylophagous pests, exactly where they are found in the trees, regardless of their stage of development (larva, pupa, adult) and it feeds on them.

Photo The woodpecker (*Picus sp*.)

Apart from their ecological and useful role, woodpeckers can also cause damages. For beekeepers,

woodpeckers are a problem in winter. Because in winter the sources of insects are at the lowest level over the year, the woodpeckers break the hives and feed with pleasure on the dead bees from the bottom of the hive or with those in the hive, thus causing anxiety to bee families by the noises they make, followed by high food intake and then diarrhea, leading to the total loss of the attacked families.

Control recommendations:

- any type of chemicals are forbidden.
- changing the apiary placement where available.

4.5.3. Mammals

Rodents (*Mus sp.*, *Ratus sp.*)

Mice are considered very harmful for bees. Among insectivorous rodents, the most dangerous for bees are mice: *Mus musculus* (house mouse), *Mus aparius* (wild mouse), *Mus silvestricus* (wood mouse) etc.

Photo. Mouse (*Mus sp*.)

***House* mice and wild mice** penetrate the hives in autumn, before the winter season, through the bee entry or through other cracks, they eat honey, bee bread, destroy combs and disturb bees. They cause destructions of honeycombs in the storages, as well as to the bee colonies and their excrements give a specific unpleasant odor to the honeycombs. Due to this, in spring, bees that have been attacked by mice leave their nest. During the winter, the disturbed bees eat more, thus producing an early bulking of their posterior intestine followed by diarrhea. Rats (*Ratus* sp.), as well as mice, cause damage in hives, because once they enter the hive, they eat the honey and disturb the hive.

Mice control:

- verifying thoroughly each hive to identify potential mice;
- installing grills against mice ;
- poison or poisoned seeds cannot be used;
- it is recommended to have a bee entry of approximately 10 cm in length.

Photo. Rat (*Ratus sp*.)

Other mammals

Out of the superior mammals the following can be mentioned:

- the bear (*Ursus arctos L.*) large mammal, who attacks apiaries when it cannot find anything else to eat or when bees are collecting from his area;
- the badger (*Meles meles*);
- the marten (*Martes martes* and *Martes foina*);
- the ferret (*Putorius putorius*);
- the hedgehog (*Erinaceus vulgaris*).

The damage caused by these animals is sporadic and quite insignificant. Only in the mountain regions, during the winter and sometimes in summer during the raspberry harvest season, the bear can cause considerable damage, when it might destroy an entire family every day.

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