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BOOK REVIEW OF APICULTURE

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ABSTRACT

Apiculture can be defined as the keeping of bees especially for commercial purposes. The main countries concerned with the exportation of honey are found in Asia and South American countries while the main countries importing honey are Arabian countries, Japan, European countries, Canada and USA.

As bee products, we have honey which is the transformation of saccharine into glucose sugar on the effect of invertase which contains the bees' saliva; the royal jelly which contains water, proteins, amino acid, lipids and oligo-elements; pollen; wax; propolis; pollination etc

Bees like most insects are divided into 3 major parts: the head, the thorax and the abdomen. Their principal organs are digestive system, the respiratory organ, the circulatory organ, the urinary system, the male reproductive organ, the female reproductive organ and the nervous system.

Bees are special insects which have social organization. We have the queens, the workers and the drones. The queen has short wings, a long abdomen and an oval head. Apart from being the only egg layer in a normal hive, it is a source of important chemical messages, known as pheromones. The drones have to eat and take care of the queen. As for the workers, they take care of the ovaries and cleaning of the hive, and they also ventilate and warm up the hive.

Talking of techniques of agriculture, we have fixed and mobile hives. At the harvest moment, the bee keeper wears a special dress in order to protect himself from stings of the insects. These are helmet or cap, gloves, boots …

Concerning the installation of the bee hive, the zone must be rich in natural vegetation with harmless plants for the bees, reason why savanna and forest zones are better than mangroves and swampy zones because the honey produced in these zones are bitter. The hive should be installed during favorite and appropriate nutrition periods and it should be comfortable. The support should not be accessible by

predators like termites, rats; the hive should be suspended, the hives should have a space of at least 50 cm from each other with different orientation and we should take note of the entry hole because it should not be big East – South – East orientation are preferable so as receive the morning solar rays.

Bees face diseases which can be anatomic, physiologic or behavioral. Here, we have decisive and favourable causes.

In harvesting honey we have to be very delicate, smooth and swift. After that, we proceed to filtering, and packaging honey.

GENERAL INTRODUCTION

Apiculture can be defined as the keeping of bees especially for commercial purposes. Since the past centuries, man has started being interested in the culture of bees. Apiculture is an activity which is exercised in every continent and whose product is searched in the medical society.

It is an activity representing an interesting part of rural world, given that its control does not demand much money.

I- APICULTURE'S ECONOMY

Economy has to do with the processes of demand and supply: who sells and who buys. It is estimated that there is an average of 5 to 6 types of apiculture in the world, containing at least an average of 50 to 60 types of colonies. The continental production rate is classified as follows: 34% for Europe, 28 to 29 % for Asia, approximately 25 % for America, 8 – 9 % for Africa and 25% for Australia.

Meanwhile, the biggest zone of production is found in Africa and Australia (Austral Africa). At the level of exchanges, about 300000 matrix tons are the objects of exchanges. The main countries concerned with the exportation of honey are found in Asia and South American countries while the main countries importing honey are Arabian countries, Japan, European countries, Canada and USA.

II- BEE PRODUCTS

1- HONEY

i- COMPOSITION.

The composition of each honey type is related to the nature of the vegetation used. Chemically, honey is the transformation of saccharine into glucose sugar on the effect of invertase which contains the bees' saliva.

Water: not more than 20%

Glucose and Fructose: inverted sugars 60% responsible for sweetness,

hygroscopic properties(water loving),energy value and physical characteristics.

The hygroscopic nature of honey, its tendency to give up moisture more slowly than sugar, retards the staling of baked goods. This is why honey has remained popular in baking.

Maltose and sucrose: 5% (sugars) small amounts.

Proteins: (mainly *enzymes*) small amounts.

Acids: (such as acetic, butyric, citric and trace of amino acids) small amounts.

Minerals: 0.25% ash (darker honeys are usually higher in mineral content).

Pigments and Essential oils: (which add fragrance and flavor) small amounts.

This richness determines the diversity of its utility.

ii- USES OF HONEY

Honey is used as an energetic element. It supports the physical and intellectual activities.

Honey also favors asseveration. It is also indicated for intestinal troubles, it is also advised for diabetic patients. It is helpful in respiratory sicknesses. Honey is also a sub – product in industrial pharmacies and alimentation.

It is elaborated by cookers, it constitute the lava's food exclusively up to 3 days. It is also the exclusive food for the queens.

It regulates the rate of sugar in the Blood. It is also useful in case of doubt in vascular problems. It has properties against cool; it is found in the honey of bees. It is also found around lavas with less than 3 days.

2- THE ROYAL JELLY

Produced by the workers, it constitutes food for the larva up to three days and the exclusive food of the queens.

I- COMPOSITION

The royal jelly contains water, proteins, amino acid, lipids and oligo-elements. In fact, they have the same elements like honey, in addition to ribonucleic acids and deoxyribonucleic acids.

II- uses

- It corrects anemia and reduces the rate of sugar in blood (diabetics)

- It acts against cardio- vascular problems.

- It has anti -viral properties.

3- POLLEN

Pollen, the male organ of flowers, is collected in small balls of the bees.

I - COMPOSITION

It has 5% fats, 15 to 30% proteins, amino –acid, 25 to 40% carbohydrates, oligo elements, vitamins, an anti-biotic and a growth factor.

II- PROPERTIES AND USES

Pollen it used in:

- Gastro-intestinal problems
- To fight against anemia
- As a stimulant during convalescence
- To favorer psychism and the intellectual effort.
- In the case of cerebral and heart bleeding.
- In slow growth, prostate troubles, and against diabetics

4- WAX

Wax comes from the reform of old shelves and the covers of cells.

i- CHEMICAL COMPOSITION (downing et al. 1961)

- Carbohydrates 16%
- Monohydrate alcohool 31%
- Diols 3%
- Fatty acid 31%
- Hydroxy acid 13%
- Other substances 16%

ii- PROPERTIES AND USES

-Wax, rich in vitamins, is used in pharmacies in many cosmetic products.

-it is recommended for nasal infections such as sinusitis, coryza, has fever and asthma.

- Wax equally helps in the manufacture of candles. It is also used in carpentry to polish wood.

5- PROPOLIS

It is obtained by scrubbing the frames that the shelves or the internal Partition of the hive. Propolis comes from the harvest of resinous substances from tree buds or y the harvest f resinous substances from plants.

i- COMPOSITION

Propolis is constituted of:

- impurities 3%
- pollen 3%
- Wax 20%
- Balm 6%
- Tannin 10%
- Resins 40-50%
- Vitamins
- An anti biotic substance

ii- PROPERTIES AND USES

Propolis is used:

- For the treatment of wounds, injuries and burns.
- Against heart and blood vessel lesion.
- For the treatment of ulcers.
- As antibiotic in many mouth affections, respiratory organ affection.
- In gynecology and in ophthalmology.
- As conservant of beauty products and takes part in the upkeep of the skin.
- As an anesthetic product more actif than cocaine.

6- THE BEE'S VENOM

It is obtained from the venom porch (sting) situated on the extremity of the workers abdomens.

i- COMPOSITION

Water, formic acid, chlorhydric acid, phosphoric acid, molittine (toxique), histamine and apamine.

ii- USES

The bee's venom is used:

- Against rheumatism and infections.
- As tonicardiac, anti coagulant and vaso –dilator.
- It develops immunity against certain illnesses.

7- POLLINIZATION

The role of bees in pollinization is very important from the point of view of the preservation of the vegetal biodiversity and thus that of the environment. Bees take part in 80% of cases of entomophile pollinization and it is proven that they ameliorate 20 to 30% the level of pollinization of fruit trees and more, fruits which when falling will develop better and will better resist illnesses.

III- KNOWLEDGE OF BEES (DESCRIPTION, ANATOMY AND PHYSIOLOGY, AS WELL AS THEIR SOCIAL ORGANISATION)

Bees like most insects are divided into 3 major parts:

- The head
- The thorax and
- The abdomen

i- THE HEAD (18 – 22mm)

The head differs with respect to the type of bee. In the queen the head is round and pear shaped. In the drone it is circular, while it is flat and oval in the workers. The head carries two types of eyes and sensory organs.

- 2 compound eyes
- 3 triangularly placed eyes
- A pair of antenna.

Closer to the eyes is the buccal cavity with the upper lips that protect the mouth. They have mandibles for chewing wax and dismantling. Equally present are jaws and inferior

lips and a tongue called proboscis (5-7 mm long) to hold flowers as it serves as a funnel. There are equally salivary glands which produce the royal jelly, pharyngeal salivary glands proper to the queens and the thoraxic salivary glands.

ii- THE THORAX

It comprises of 3 segments, each segment containing a pair of legs, each of these legs are specialized in functions. The last pair of wings is called basket, because it is specialized on the collection of pollen grains by adhering in workers. The front pair of legs is involved in cleaning the eyes, antenna, and head to mouth of pollen.

iii- THE ABDOMEN

It is a distinct continuation of the thorax and composed of 6 segments ending with large intestines and respiratory organs, as well as reproductive organs.

Also, they contain nasaroft glands which produce pheromones (which permits the recognition of members of a given colony). For example: the queen's pheromones can push workers at work, it also permits the bees to know intruders in their mists.

iv- THE PRINCIPAL ORGANS IN BEES

a- DIGESTIVE ORGAN (SYSTEM)

It starts with the mouth, esophagus, sabot, and intestine. The digestive tract congests of 2 segments: a transformation segment and the nutrition segment.

b- THE RESPIRATORY ORGAN

The respiratory organs and consist of a series of pipes (tubes) which communicates with the exterior. These pipes are called trachea.

c- CIRCULATORY ORGAN

The circulatory system is composed of a heart located on the dorsal route of the thorax. It should be noted that the heart is not related to the respiratory system and has no red blood cells.

d- URINARY SYSTEM

It is much reduced because toxic wastes are recycled by urinary tubes called (malphigian tubulus). Their muscles are very developed at the level of wings.

e- MALE REPRODUCTIVE ORGAN

With respect to the anatomy of the male bee, the male bee has 2 testis related to a mucus gland, an ejaculatory and copulation organ. The peculiarity in male bees is that they die during copulation because of the lost of their sting during this act.

f- FEMALE REPRODUCTIVE ORGAN

It is constituted of a pair of ovary related to the lateral oviduct which fuses to form the normal (common) oviduct. There is also a spermatide related to the oviduct. Also present is the external copulant (valve), the spermatide has the possibility to stock spermatozoids during 4 – 5 years.

Meanwhile, the queen lays two categories of eggs: fertilized and non fertilized eggs.

Between 7 and 20 days, after its transformation into an insect, the young queen makes many nocturnal flights as far as the spermatides are not full enough. This queen only comes back to the hive to eat the royal jelly and to lay about 2000 – 2500 eggs per day. It lays eggs of both fertilized and non fertilized eggs.

The unfertilized eggs give birth to the drones while the fertilized eggs give birth to the workers. These eggs are laid in nests. The fertilized eggs produce queens which are disposed in long tubes.

g- NERVOUS SYSTEM

Bees have a system which harmonizes all the organs.

v- SOCIAL ORGANISATION OF BEES

Bees are special insects called social insects because they can never live solitary lives but live in a society (community).

a- CHARACTERISTICS OF QUEEN

The queen has short wings, a long abdomen and an oval head. Apart from being the only egg layer in a normal hive, the queen is a source of important chemical messages, known as

pheromones. As the queen moves over the comb during her egg-laying activities, the adjacent bees turn towards her and while appearing to groom her collect these pheromones, which are passed from bee to bee throughout the hive. This has the effect of sending around the hive that a laying queen is present and of bonding up to 50000 or so bees to act as a single unit.

b- CHARACTERISTICS OF THE MEMBERS OF THE COLONY

1- THE DRONE

Round head, equilibrated wing with respect to the abdomen, their function is to eat and take care of the queen.

2- WORKERS

Have short live span of 40 – 50 days; their activity is between 1 – 14 days in the hive. Their body is covered with many furs (hairs), they take care of the ovaries and cleaning of the hive, and they also ventilate and warn up the hive. Between 7 – 14 days, they produce the royal jelly, and from 14 – 21 days, they start producing honey until they die. It should be noted that the mark (dark) is in respect to age.

A cast is a colony with an active queen, 10 – 60000 workers and 600 drones, lava and pollen and honey reserves. 10000 bees weigh about 1 kg.

A swarm

It consists of a group of females, drones, workers in search of a habitat.

Swarming refers to the process by which a colony splits after the production of another queen.

Favorable condition

The life cycles of the different members of the bee hive are as follows;

- Queens : 15 days eggs
- Workers : 24 days nymphs
- Drones : 21 days metamorphosis

The cycle continues to replace the queen.

An orphan hive is hive that has no queen or with a dead queen.

IV- TECHNIQUES OF RARING OR TECHNIQUES OF AGRICULTURE

- The choice of objective/honey, wax, pollinisation
- Choice of the race of bees
- Choice of the system of raring : Potentials of the bees

  Sedentary cleavage – installation of hive in a particular place

  Transhumant cleavage

In winter, the hives are displaced from mountains to low land.

Definition of transhumance: the cyclic displacement of animals from place to place.

Nomadic cleavage: When animals move from place to place without hope of returning back (Rhine canal)

Irrespective of the system of raring, the problem of habitat must be solved. Habitat for bees must answer certain exigencies notably exigencies in terms of atmosphere.

- Bees live in holes found on tree trunks, roofs of houses fractures of rocks. Irrespective of the habitats, they find comfort.
- Aerial comfort
- Security

Two types of hives are known

- Fixed hives
- Mobile hives.

i- FIXED HIVES

Fixed hives have different forms, heights, atmospheres. The bees orientate the construction of this stock. These fixed hives should not limit flight and render its cultivation possible. The mobile hives overcome these situations.

ii- MOBILE HIVES

It comprises:

- A cover (lead)
- A hive body

- A support with height higher up to 30 – 50 cm above the soil.

The cover prevents the penetration of other insects.

The body of the hive has handles to lift it up.

V- FEEDING OF BEES

Feeding in bees is based on the exploitation of the natural vegetation. Meanwhile in intensive apiculture, artificial nutrition is more and more frequent when natural conditions do not permit such nutrition. In winter for example, environmental perturbations, insufficient or lack of flowering or overcrowding of the colonies render natural feeding almost impossible.

ARTIFICIAL FEEDING

- Harvest and stocking of nectar during periods of abundance
- Harvest of pollens of plants (harvesting followed by stocking)
- Corn (maize) or cassava flour
- Water
- Sugar juice.

VI- EQUIPMENT OF APICULTURE (OF THE BEE KEEPER)

It has as objective to favor the comfort of labor via the amelioration of security, easy working conditions and efficiency in labor.

First of all we have the apicultural dressing (clothes) with the aim to protect the bee keeper from stings of the insects. A helmet or cap with a net covering the face hence protecting the eyes, ears, jaws, etc. Also present are gloves clasped in the facilitation of labor. The dress must be heavy with boots in which we stock in the trouser.

- A handle to lift up the wax
- A knife to remove or cut off the honey comb and eventually removing the cover (lit) containing honey
- Also necessary is a hammer and nails
- A spade, hoe and digger
- A saw

- A swarm of bees easily made serving to scrub the bees in the honeycomb
- An instrument also needed is amphumor

It comprises of

- A combustion chamber
- A blower
- The beck
- The sprint
- Perforated plate

COMBUSTIBLE

CHARACTERISTICS OF A COMBUSTIBLE

It should not be harmful for the bee keeper, the bees and the products from the hive (honey comb) as it might give a bad taste, color or even been toxic. A good combustible should be made:

- Of bamboo
- Pin.

MODE OF ACTION OF AMPHUMOR

- Anesthesia system on the nervous system of bees
- System of regurgitation of honey, makes abdomen to be straight and makes stinking difficult
- Matches
- Recipients for the harvest of honey highly need are those with covers
- Extraction material is needed, filter, manual extractors, either automatic or semi-automatic
- Conditioning or storage recipient.

VII- INSTALLATION OF THE BEE HIVE

Orientation of the bee live

The zone must be rich in natural vegetation rich with harmless plants for the bees, reason why savanna and forest zones are better than mangroves and swampy zones because

the honey produced in these zones are bitter. This is why the Mungo in Cameroon is restricted from honey cultivation due to the high rate of spraying in this zone.

Access to the site should be easy, free from strong winds, sun and rain free hives. Also the neighbors should not be affected by the presence of the bee hive taking note of schools and others.

Not all moments are necessary for the installation of the hive, it should be installed during favorite and appropriate nutrition periods and the hive should be comfortable. It is advisable to install the hive in March because there is enough flowering and swarming of the bees; the rains attack the houses and permit harvesting of honey because the bees will be forced to move away.

Installing the hive can be done in many ways, either it is installed as high as possible on trees to insure safety of passers-by and that of the bees; it doesn't prevent it from being stolen but makes it more difficult but the inconvenience of this method is that, it is difficult to make a follow up of the hive. This is why it is preferred to be installed at the reach of man.

Resistant supports are needed.

- The support should not be accessible by predators like termites, rats;
- The hive should be suspended
- The hives should have a space of at least 50 cm from each other with different orientation
- Orientation: take note of the entry hole because it should not be big East – South – East orientation are preferable so as receive the morning solar rays. When the hive is placed in such a way, it eases bee entry and permits them to more freely inside the hive.

VIII- METHODS OF POPULATION INCREASE IN BEE HIVES

These hives can be populated by capturing natural swarms, by swarm induction, acquiring a new colony from another bee keeper, raring of queens. For this to be done, we place charms (baits), the first bait is a comfortable one situated in a comfortable zone and site. We can also use other baits.

Nevertheless, more artificial baits are constructed industrially in industries.

Such baits remain clean for long and remain attractive.

Frequently used baits for honey, wax, sugar cane, flour, palm wine, salt, palm oil.

i- RARING OF THE QUEEN

A barren colony with no queen of the colony is normal, the building of the royal chamber and the induction of the queen. Before rendering the colony barren, be assured that there are lava of less than 3 days old because without lavas no fabrication of the royal chamber and no introduction of the new queen.

ii- FREQUENCY OF VISIT

It is a setting with many considerations, the visit should be frequent.

- It is to see if there are still baits. Meanwhile, the frequency is in function of the number of kilometers separating us from the hive.

iii- VISIT PROPER OR MANNER OF VISIT

- The security of the bee keeper and neighbors should be assured and not neglected.
- No sound of cutlasses from workers
- Never attack the bees
- Never panic or hide face if need be bend and use water to create a false rain.

Work fast without precipitation. In case of sting, rush to a nearby hospital and be injected with anti-histamine, if possible go to farm with spirit (alcohol), garlic, etc and dress a few meters from the hive.

- See the general state of the hive; make a general view of the state and condition of the environment surrounding the hive to know if things have changed from your last visit.
- Take note of the behavior of the bees
- Open the hives continuously rather than opening them all at once.
- To open the hives be assured that the smoker is on pump (4 pumps) and allow the smoke to settle in the hive and wait for 2 -3 minutes to remove the cover and the honey comb.

- To harvest the honey you should not remove all the honey from the honey comb for instance, if we have 6 combs, we can decide to remove 4 and leave 2 in order for it to serve as food for the bees. Also, it is in function of the season of harvest.
- Be careful of the type (category) of bees and take note of the state of the boxes: its normal state of production
  - Stock of honey
  - Stock of pollen
- See if the honey is ripe or not because only ripe honey is advised for consumption and the unripe is toxic and harmful
- Take note of the presence or absence of an eventual disease
- Remember to close the hive after opening in opposite order of opening. That is, if it was opened in the order 1, 2, 3, it should be closed in the order 3, 2, 1.

IX- DISEASES IN BEES

Any persistent nuisance of any type can be anatomic, physiologic or behavioral.

General pathology or illness in bees

It studies the different types or development and evolution of sicknesses.

Pathology takes care of diseases with respect to species and causative agents.

Two categories of causative exist.

DECISIVE CAUSES

Diseases having causes without which there is no sickness, causes can be endogenous, genetic sickness, hereditary.

The diseases can be constitutional, functional or behavioral, while the causes range from exogenous; that is, related to external factors (environment of the animal), mechanical, chemical, physical (cold) and biological.

FAVORABLE CAUSES

No favorite cause can cause the disease. Nevertheless, all the causes are endogenous, exogenous.

Endogenous: Development where action is dominant by weakening the receptive organism.

X- HARVEST, FILTERING AND PACKAGING OF HONEY

1- HARVEST

The manipulations have to be done with delicacy, smoothness and swiftness while avoiding too many unjustified visits. In all cases, avoid leaving honey, frames and other objects lying around. This can attract looting bees which can cause great damages to the colony.

Bear in mind that honey belongs to the bees for their survival; consequently, we should always allow theirs sufficiently.

- For the fixed hives with the helves stretching in the direction of the length we take the lateral shelves.
- For the fixed hives with round shelves, we harvest the shelves that are farthest from the entry of the hives.
- For the hives with mobile frames, we take the back frames.
- The harvest is covered in a bucket and brought to the processing house, which has to be always clean with water always present for cleanings.

2- FILTERING

Proceed by triturating the shelves, then the filtering of the paste thus obtained. We could equally proceed through squeezing. It takes less time but requires much work.

- Break the shelves into pieces and then put them in the sieve of the squeezer.
- Put the presser bloc on the shelves and close back the press.
- Turn the crank until it becomes resistant.
- Retrieve the honey in a recipient and filter it with finely stitched sieve (200-400UM).
- Allow the filtered product in a maturator for 3 to 5 for decantation.
- Put it in bottles or plastic recipients; recipients with large necks are preferable to facilitate removal in case of crystallization (a very frequent phenomenon).
- Do as many filtrations as possible with finer sieves until you obtain limpid honey without impurities (remains).

3- PACKAGING

Packaging consists of introducing the honey in clean recipients, preferably new ones: recipient of recuperation are discouraged since their cleanliness cannot be guaranteed. In case of necessity, be sure that their previous contents were comestible (wine, kitchen oil). They should preferably be n glass recipients to resist sterilization with hot water. The packaging ends with an etiquette clearly indicating the origin of the honey, the address of the producer and the address of the packaging house. The honey should be conserved at ordinary temperature and it should be sheltered from light. In such conditions, its time lapse is 5 years. The recipients should be well close after every removal.

XI- THE TECHNICO-ECONOMIC MANAGEMENT OF APICULTURE

1- TECHNICAL INDICATORS.

Like for all activities, an efficient system of evaluation constitutes the bas of its amelioration and progress. This has to do firstly with the putting n place o a coherent system of collection, classification and organization of data in view of calculating indexes known to be valuable to be compared to the reference norms at the local, regional, national and international levels. Every hive has to be numbered in all its principal characteristics (type, form, height, date of fabrication, data of deposit, population, harvest, quantity of honey and all other activity o interest) written in register.

Some examples of evaluation index in apiculture

- Number of hives per apiary
- Division of hives in types
- Number of populated hives
- Rate or percentage of population
- Number of percentage of desertion
- Intervals (days, weeks, months) between deposit and populating
- Interval between deposit and harvest
- Number or percentage of harvested hives
- Quantity (liters, leg…) of honey harvested per hive
- Quantity of wax
- Quantity of honey sold and prizes

2- EVALUATION OF THE PRODUCTION OF HONEY

Honey is the principal product of agriculture but it is also the most delicate. That is why we need to do a lot of characterization.

- Quantity
- Organoleptic, phisico-chemical, bio chemical, microbiological, biological and technological qualities.
- The colour of honey (amber-coloured, white water; extra whithe) . the colour of honey is objectively evaluated with the help of the
- From the point of view of its floral composition, there are unifloral and multifloral types with respectively one , two or none of the dominant melliferous plants
- The characteristics of honey vary enormously in relation to indogenic factors but especially exogenic factors (season, vegetation…)

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