



Modern Bee Farmers



P.O.BOX 687-0618
RUARAKA
TEL: 2382604/5
MOBILE: 0733-767-422
0722-222-025
0724-469-622
email:modernbees@yahoo.com
www.modernbeefarmers.com

YOUNG TRADERS BUILDING
2ST FLOOR
.OPP CITY STADIUM ROUNDABOUT
JOGOO/LUSAKA ROAD
NAIROBI

APICULTURE TRAINING, BEE KEEPING EQUIPMENT & PURE NATURAL KENYAN HONEY

BASIC BEEKEEPING AND THE LANGSTROTH_BEEHIVE

HONEY BEE

The honeybee is a social insect that lives in a colony consisting of, one Queen, Drones and Workers. A colony is made up of about 60,000 bees.

QUEEN BEE



The queen is the heart of the colony. In every colony we have only one Monarch “the Queen”. A worker larva is fed with Royal Jelly to produce a Queen Bee. Her main work is to lay eggs, and can lay up to 2,000 eggs per day. She also produces different kinds of pheromones to communicate with the colony.

THE DRONE BEE



This is a male bee, which is hatched from an unfertilised egg. It's only work is to mate the Queen.

THE WORKER BEE



This is a female bee with undeveloped female organs. She cleans, builds combs, and brings in nectar and pollen. She protects the colony by stinging any predators and after stinging she dies.

BEEKEEPING

Beekeeping started about 15000 BC. Men started by robbing bees of their honeycombs from caves, tree-holes and rocks. Later he thought of domesticating wild honeybees by providing a home for them. He started by hollow logs, woven cones gourds, clay pots and calabashes. This was until the modern technology was brought forth by L. L. Langstroth in 1851. He said that he got a revelation from God on how to make a hive with movable frames and foundation wax.

LANGSTROTH HIVE COMPONENTS



TOP COVER (ROOF)

This is a sheet of hard board covered by a sheet of metal (Aluminium). The hard board acts as an insulator.

BROOD BOX

This is where the Queen lays her eggs feed and hatch into young bees. This is where bees store pollen and honey for themselves.

SUPER BOX

We have (3) three types of supers. This is where bees put excess (store) honey, and where we harvest from.

BOTTOM BOARD

This is the bottom part of the hive, which rests on the stand. It prevents cold and stops bees from extending the combs downwards.

FRAMES

Built to fit the box and movable with wires and foundation wax

QUEEN EXCLUDER

This is made using wire mesh that allows worker bee to get through to the super. It excludes the queen and the drones.

BEE ESCAPE/CLEARER BOARD

A mechanical trapping device with arrangement in such way that bee can go one way but not another.

SITTING/SETTING UP THE APIARY

Before anybody thinks of keeping bees, the first question is where he/she will keep his/her (bee) hives. How many colonies?

A place where a beekeeper keeps his/her hives is called **“AN APIARY”**.

Here are some general considerations about the apiary.

- Should be approximately 50m away from the homestead, public roads, public grounds, school and all social places, unless otherwise.
- There must be a shade over the hives.
- Good road and path is of most important.
- Near water sources.
- Where there is no strong wind.
- Should be protected by windbreaker.
- Where there is no noise.
- Away from flooding areas

PUTTING UP STANDS

It is well known that bees encounter great trouble with pests and other predators such as, ants, lizards, honey badgers etc. We need to put our hives where all the above mentioned enemies will not get access to the hive.

STEPS

1. Make a good path to where you want to set up your apiary.
2. Cut the grass and the hanging branches, small trees that may hinder good movement within the apiary.
3. Remove all those cuttings and trimmings away from the site.
4. Using 3 poles @ 12 fts long and fairly thick and strong to support up to 135 Kgs (Hardwood can be the best).
5. Make a goal per the illustration at the back page. Put your post in the ground leaving 8 fts above ground. Then put a cross bar on the two posts.
6. Cut 2 pieces of 20" of 2"x2" timber, 2 pieces of 15" of 2"x2" timber. Leave 1" of the two sides of the 20" timber and join the 15" timber. On the (one) 1" left drill ½" from the edge. Do it to the other 20" timber also. Get 2 pieces of wire @ about 9.5" fit long. Loop your wires over the cross bar and make a swing like platform by fastening your wires through the drilled holes on the stand. Make sure your stand is 3.5 fts off the ground one goal can support 3 hives.

CATCHING A SWARM

You need to have "nucus" or nucleus to be able to catch a swarm of bees and transfer them to the hive. Nucleus is a small hive composed of 3 to 5 frames. It is possible to trap bees many kilometres away and transport them to your apiary. Many beekeepers in East Africa can not afford or do not know much about the

nucleus. You can use your brood box as a catcher box or nucleus. Use a wire or a synthetic rope to hang your catcher box under a branch of tree, but do not hang it too high.

BASIC MANAGEMENT

Before you start handling bees it is necessary to have the following items:

BEE SUIT & VEIL

This will protect you from bee stings, and should be of a bright colour.

GLOVES & BOOTS

You must be protected on every part of your body.
Make sure bees can not crawl under the bee suit.

SMOKER

Moses Quinby has the credit for first making a bellows bee smoker in 1870. It had however one serious defect, that it would go out. The fire pot was not properly ventilated. A few years later T.F. Bingham and L.C. Roots Son-in-law of Mr Quinby introduced a bee smoker on the principle, so the smoker that we use today is called 'BINGHAM SMOKER'.

HIVE TOOL

The other essential piece of equipment is the hive tool. This is a strong metal bar about 250-mm long. One end is chisel-like. The other end is slightly bent and sharpened for scraping.

BEE BRUSH

Bees can be brushed away from the comb using the brush.

SMOKER FUEL

Wood Shavings are voted the best fuel in a smoker, but not every part of the country you can find them.

For that matter it is possible to use the following fuels as supplement.

- Saw dust
- Cow dung
- Grass
- Rotten wood

- Elephant dung

Do not use chemical fuel.

TRANSPORTING THE COLONY

Your brood box can be used as a catcher box by hanging it on a tree or placing it on a high surface. Then once colonised it is moved. This is done after two weeks of colonisation. Close the entrance after smoking it.

Use foam sponge or a piece of cloth; do not use any plastic or anything that can hinder air. You can use bee screen meshed roof for better ventilation. Tie the floor, brood box and roof and carry it upright. Place it on the hanging stand. Do not forget to remove the foam from the entrance.

INSPECTION

Inspection is meant to monitor the progress of your colony. It should be done once every week.

Reasons:

- (i) To check for wax moth on small colonies.
- (ii) Destroy queen cells to avoid swarming (should be done when you are sure there is a queen present).
- (iii) Clean the hive
- (iv) Confirm whether colony is ready for supering.

INSPECTION GUIDELINES

- Make sure you light your smoker before putting on your bee suit.
- Dress and make sure you are fully protected.
- It is advisable always to work in two's.
- Start by smoking the entrance, and then open the roof using your hive tool, and give a few puffs of smoke and put back the roof for a short time.
- Open the hive and inspect by removing one frame at a time. Do not hold the frames away from the hive.
- Do not stand in the flight path of the bees (entrance).
- Make sure grass and branches do not get too close to the hive. All dry grass should be taken away from the apiary in case of any fire accident.

SUPERING

Any beekeeper that is after making money from the honey should know the right time to super up. If you have inspected your hive and found that 9 to 11 frames are built-up and most important there is good flowering in the area, then it is time to put on a super. Supering should be done one to two weeks before the honey

flow. If 10 or 11 brood frames are fully built and there is no sign of flowering, there is no need to place supers unless there is congestion in the brood box.

HOW TO SUPER

Be ready with your super and queen excluder under the super. All frames should be well arranged with intact foundation wax. Smoke the bee entrance, open the lid and smoke (give a few puffs of smoke), put it back and wait for sometime. Remove the lid and gently, put on your super making sure that you do not kill bees on the edges. Make sure that the queen excluder and the super fit well on the hive. Place the cover back on and smoke a little on the entrance as you leave.

HARVESTING

You must be decided on what type of method you want to use in harvesting. We have four basic methods usually used to clear bees from the filled super.

(i) BRUSHING AND SHAKING

The combination of the two can be used; this involves removing each filled comb separately from each super then replacing the comb with a new one

DISADVANTAGE

Extra handling is required.

(ii) ESCAPE/CLEARER BOARD

A mechanical trapping device that allows the bees to move out of the super usually down and can not get back. It is placed between the brood box (above the Queen excluder) and the super.

DISADVANTAGE

Three trips are required to the apiary.

- Inspection
- Placing Escapes
- Removing the honey

(iii) CHEMICALS

This is where by chemicals are given to the colony and the fume will drive away bees, or make them faint or confuse them.

DISADVANTAGE

- Skill and caution is needed.
- It's expensive.
- Can contaminate honey.

(iv). BLOWER METHOD

A portable air compressor is used to blow bees away from super with honey.

DISADVANTAGE

- It is expensive.
- It is heavy to carry
- Needs power source
- Makes some noise
- Black bees are mostly irritated by strong blows.

Now that you have chosen the method you want to use, you need to remember a few things.

- Do not over smoke on honey.
- Do not harvest when it is raining.
- Do not hold the combs with your fingers.
- Do not harvest combs, which are not $\frac{3}{4}$ capped.

TRANSPORTATION AND STORAGE

Very few beekeepers who can afford vehicles to move the supers with honey from the apiary to the store. Others will find difficulties because there are no roads to the apiary. In other places roads are impassable during wet seasons.

Whatever means you choose remember:

- Do not put your super with honey on the ground.
- Make sure when moving, the frames do not knock one another because combs can be broken.
- Do not tilt the super on the side with the handle.

- Never bang the super on the ground or on another object.
- Cover your honey to avoid bees from robbing you.
- Handle the super from the grooves on the two sides of the super; let it rest on your stomach muscles if you have to walk along distance. This will enable you to see where you are stepping

STORAGE

These are few guidelines on honey storage.

- Have a bottom board and stack your supers one on the top of the other. You can put up to 8 supers high. Make sure no holes or space where bees can get through. Cover on top with another flat board.
- Make sure all the frames are well arranged.
- Use masking tape to seal where you suspect the bees can get through.
- Do not put your supers directly in the sun.
- Keep them away from a humid place.
- Put some oil, grease or ashes around the supers on the floor to keep super ants away.
- Visit your store every day to inspect.
- Do not over-store honey in the supers.

Extracted mature honey can stay for 3,300 years; Dr T M Davis discovered this in an Egyptian tomb of Queen Tyi's plant. He found a hermetically sealed jar of honey among other foods put into the tomb (for use in the life after death).

BEES PLANTS NECTAR AND POLLEN SOURCES

Bee botany: this is the study of plants herbs and shrubs that are of economic use to beekeeping industry.

IMPORTANCE OF BEE BOTANY

- It is important for the farmer to have some knowledge about the food sources of the bees
- Plants determine the geographical region of honey source
- To identify toxic plants that contaminate pollen
- Problems of beekeeping in relation to insects sprays and how to solve them

- To know blooming period so as to time honey low periods/seasons
- To identify attractant plant species such as *Oscium sp.* And *Teclea Simplicifolia* (Maasai of Laikipia)
- Knowledge about sugarcane areas where sucrose/sugar are produced which are of little economic importance to beekeeping
- Understand some plants which are repellents i.e. *Targetes Minuta*, puff ball *Walburgia longimanii* and plant species which give hone with nasty characteristics, not fit for human consumption. Some of these plants include Castor Oil Plant *Ricinus communis* poison arrow tree *Acokanthera schimperii*, avoid harvesting when such plants are in flower
- Understand some of the plants with beautiful flowers yet bees do not reach their nectaries because of their large corolla/long style i.e. Nandi Flame *Spathodea cumpanulata* , *Tecoma Stan* and *Markhamia Lutea* all belonging to the family of Bignonia.
- Understand some of the plants that are carnivorous i.e. trap and digest flesh of insects and small birds. Such plants secrete false nectar which lure foragers and finally entangle them. In India 70% of such plants are found there. There are about 300sp. of this nature world wide. *Mimosa Puntica* touch me not is one of the rear species found in Kenya. It is important that if a farmer discovers such unique behaviours, he should remove the plant or avoid or avoid siting apiary within the area.

CULTIVATED CROPS

SCIENTIFIC NAME	COMMON NAME	VERNACULAR NAME	VALUE
<i>Coffea Arabica</i>	Coffee	Mkahawa – Kiswahili	Nectar and pollen
<i>Psidium guayava</i>	Guava	Mpera – Kiswahili	Nectar and pollen
<i>Cajanus cajan</i>	Pigeon pea	Njugu – Kikuyu – Nzoo- Kikamaba	Nectar and pollen
<i>Anacardium occidentale</i>	Cashew nut	Mkanju – Kiswahili	Nectar
<i>Hellianthus annus</i>	Sunflower	Alizeti – Kiswahili	Nectar and pollen
<i>Citrus sinensis</i>	Orange	Mchungwa – Kiswahili	Nectar and pollen
<i>C. grape</i>	Grape fruit	Mndazi – Kiswahili	Nectar and pollen
<i>C. lemon</i>	Lemon	Mlimau – Kiswahili	Nectar and pollen
<i>Magnifera indica</i>	Mango	Muembe – Kiswahili	Nectar and pollen
<i>Persea Americana</i>	Avocado		Nectar and pollen
<i>Vignia sinensis</i>	Cowpea	Kunde – Kiswahili	Nectar and pollen
<i>Prunus africana</i>	Red stink wood	Omoiri – Kisii	Nectar and pollen
<i>Ipomea batatus</i>	Sweet potatoes	Viazi vya kinyamwezi- Kiswahili	Nectar and pollen
<i>Musa (sp) Cavendish</i>	Sweet bananas	Mkomba – Kiswahili	Nectar and pollen
<i>Zea mays</i>	maize	Mhinhi – Kiswahili	Pollen

INDIGENOUS AND EXOTIC PLANTS

SCIENTIFIC NAME	COMMON NAME	VERNACULAR NAME	VALUE
<i>Acacia abyssinica</i>	Umbrella thorn	Mugaa –Kikuyu	Nectar and pollen
<i>Acacia mearnsii</i>	Black wattle	Omotandegge – Kisii	Pollen
<i>Acacia mellifera</i>	Hook thorn	Muthiia - Kikamaba	Nectar and pollen
<i>Acacia Nilotica</i>	Egyptian thorn	Mgunga – Kiswahili, Musemei - Kikamaba	Nectar and pollen
<i>Acacia xanthoploea</i>	Naivasha thorn	Ochmnyaliliet – Kalenjin	Nectar and pollen
<i>Adansonia digitata</i>	Baobab	Mbuyu – Kiswahili	Nectar and pollen
<i>Albizia gummifera</i>	Peacock flower	Omongonjoro – Kisii	Nectar and pollen
<i>Azadirachta indica</i>	Neem tree	Mwarubaini – Kiswahili	Nectar and pollen
<i>Calliandra calothyrsus</i>	Calliandra	–	Nectar and pollen
<i>Grevillia robusta</i>	Silk oak tree	Mukima – Kikuyu	Nectar and pollen
<i>Leucaena leucocephala</i>	Luecaena	Lusina – Kiswahili	Nectar and pollen
<i>Dovyalis caffra</i>	Kei apple	Kaiyaba – Kikuyu	Nectar and pollen
<i>Sesbania sesban</i>	-	Mwethya - Kikuyu	Nectar and pollen
<i>Schinus molle</i>	Pepper tree	Mugeita – Kikuyu	Nectar and pollen
<i>Callistemon speciosus</i>	Bottle brush (red flowers)		Nectar and pollen
<i>Ceiba pentandra</i>	Kapok tree	Msufi – Kiswahili	Nectar and pollen
<i>Eucalyptus sp.</i>	Blue gum		Nectar and pollen
<i>Teclea simplicifolia</i>	-	Mti – chuma - Kiswahili Kidimu – Digo	Nectar and pollen attractant plant among the Maasai of Dol- Dol

SOME OF THE BEHAVIOURAL ASPECTS OF BEES THAT AFFECT THEIR MANAGEMENT

SWARMING

This is the natural way by which bee colonies multiply their numbers. About half of the colony leaves the hive together with the queen. Overcrowding in the hive normally causes it..

SIGNS OF SWARMING

- Increased number of bees at the hive entrance
- Increased number of drones
- Presence of swarm cells along the edge of the combs
- Increased defensiveness

Control:

- Provide ample space in the hive by either dividing the colony and/or harvesting some of the combs
- Decrease overheating by providing some shade
- Destroy the swarm cells so as to stop the merging of new queens

ABSCONDING

An abrupt departure from the hive by the whole bee colony

Causes:

- a) Physical disturbance of the hive e.g. poor harvesting methods, attack by honey badgers e.t.c
- b) Presences of pests e.g. safari ants
- c) Bad odour
- d) Starvation

The colony does not take time to prepare; hence there are remnants of food, brood, eggs e.t.c.

Control:

Proper management e.g. proper harvesting, handling of bees, proper hanging of hives, clearing of apiary and greasing of the wires.

MIGRATION

This is a natural phenomenon whereby a colony moves from one habitat to another mainly due to unfavourable weather conditions. Nothing is left behind in terms of brood or food reserves. Migrating bees seasonally follow well –established routes.

Control:

Feed bees in times of food shortage

SUPERSEDURE

This is the replacement of a failing queen by the bees.

Signs

- a) Irregular egg laying pattern
- b) Weak colony
- c) Supercedure cells on the comb surface
- d) Increased number in drones

COMMUNICATION IN HONEY BEES

Honey bees need effective communication to be socially compatible.

1. To protect themselves (mutual protection)
2. Inform each other in search of food
3. To care for the young ones
4. To accomplish mating
5. For comb construction

There are several types of communication:

1. Chemical communication - use of pheromones
2. mechanical communication - using sense of touch and using sound which can be Picked when dancing
3. optical communication - rarely used by bees

Pheromone is a chemical substance secreted from a gland and discharged or emitted externally. They convey information and illicit responses or definite reactions by other individuals of the same species. In other words, they influence or direct behaviour of other bees.

PHEROMONE	FUNCTION	SOURCE
1. Sex attractant	Sex attractant	Mandibular glands
2. Aphrodisiac	Sexual stimulation of drones	Mandibular glands
3. Swarn orientation substance	Orientation pf flying swarm	Mandibular glands
4. Swarm stabilization substance	Stabilization of landed swarm	Mandibular glands
5. Queen substance	Inhibit queen replacement and worker ovary development	Mandibular glands
6. Alarm odour	Defence alarm	Vicinity of worker sting
7. Alarm tag odour	Mark site of attack	Vicinity of sting chamber
8. Alarm substance	Provokes attack	Mandible gland of worker
9. Scent gland secretion	Orientation of position and direction	Nasanov gland of worker

ELEMENTARY FORMS OF COMMUNICATION

1) PATROLLING

Some bees spend about 2/3 of their time either resting or wondering through the anterior of the nest, the activity is referred to as patrolling. In order for [patrolling to be a form of communication, the bees should:

- a) Show a social behaviour among them
- b) Have a high ability of performing several duties
- c) Have the urge to perform extra duties
- d) Always be alert.

2) MUTUAL BEGGING

Liquid food sharing or: trophallaxis” is the exchange of liquid food among the members of the same colony. This plays a key role in the social organization of most species of the social insects.

In a honey bee colony food is passed from:

- ❖ Worker to worker
- ❖ Worker to drone
- ❖ Worker to queen

Food sharing serves as a means of communication concerning the quality of food and water. It also serves as a media of transmission of queen substance.

DANCES AS A FORM OF COMMUNICATION

They perform dances inside the hive on the surface of the comb depending on the distance of food from the hive. Bees make two types of dances.

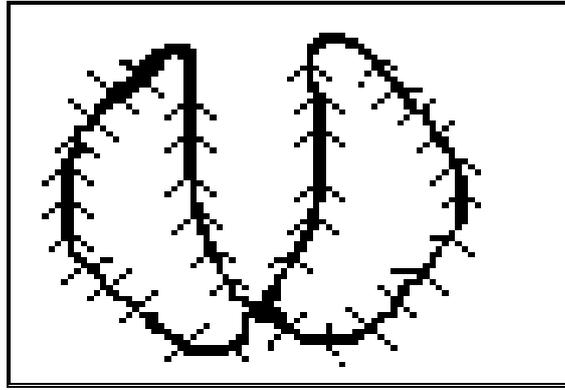
- a) Round dance
- b) Tail waggle dance

ROUND DANCE

- a) Performed when food source is less than 100m from the hive.
- b) Foragers tend to follow the dancing bee putting the antennae in the abdomen
- c) The dance is determined by the amount of food or distance
- d) A drop of nectar from the dancing bee can determine food taste
- e) Search of specific odour of the nectar when they come back perform the same dance.

In the round dance the bees run in small circles that covers a single cell; she runs approximately over six adjacent cells, suddenly reversing direction and then turning again to her original course. And so on. Between two reversals there are often one or two complete circles, frequently only $\frac{3}{4}$ or $\frac{1}{2}$ of a circle.

Round dance



Dance may be completed after one or two reversals or may go on 20 or more times after which it stops abruptly often to be resumed once or twice by the same bee at the same place or elsewhere in the nest. Consequently, the recruits get excited; they leave the dance, clean themselves, fed on honey in preparation for the foraging trip ahead and then within a minute leave the hive.

TAIL WAGGLE DANCE

- a) Performed when source of food is more than 100m away from the hive.
- b) Announces the food potentiality
- c) Distance to the food source or direction
- d) Direction which is determined by: - straight tail waggle dance - orients the direction between the sun and the food sources.

The bee runs straight on the comb and turns round, waggles her abdomen and repeats the dancing and runs another semi-circle to complete the circle in the opposite direction. Thus it roughly circular dance consisting of two halves – the figure of eight; the straight run is emphasized by vigorous shaking of the abdomen from side to side and usually by a buzzing sound made by the flight muscle and the skeleton but without noticeable wing beating.

The waggle dance differs with different species.

BEE PRODUCTS QUALITY

HONEY

Honey is a natural food product, which must be maintained to meet its delicate flavours and aroma associated with freshly extracted honey from the hive.

IMPORTANT FACTORS IN QUALITY CONTROL OF HONEY

1. Moisture content

It is the major factor that determines the keeping of honey.

- Honey is highly hygroscopic due to its high concentration of sugars
- Moisture content should be maintained between 17% - 20%
- Moisture content above 20% causes honey fermentation
- A hand refractometer may be used to check the moisture content of honey.

Other field methods of detecting quality honey are the dipstick method and the tilting method. Dipstick method

2. other additives in honey

Natural honey should not have other additives such as water, sugar fruits e.t.c

Unscrupulous farmers and dealers are tempted to add water, sugars fruits e.t.c. hence lowering the quality of honey and when this happens, moisture level goes beyond 20% while addition of sugar pushes sucrose above 5%.

3. effect on heat

Heating should be controlled between 45-50 degrees centigrade during processing. Excess heat denatures all the proteins, destroys the vitamins and the sugars are converted to a chemical called HMF.

AVERAGE COMPOSITION OF HONEY

1. water/moisture content	17.7%
2. Glucose	32.29%
3. Fructose	39.28%
4. Maltose	7.11%
5. Sucrose	1.62%
6. Others	1.03%

PROPERTIES OF HONEY

Colour – depends on the floral source

These includes light amber, amber, dark amber, golden, water white

Density - 1.39 – 1.44 at 20° C

Poor conductor of heat

Viscosity – has high viscosity compared to water. A honey sample with high water content flows readily at room temperature. Prior to straining, honey might need to be warmed to reduce viscosity of honey thus facilitating rapid straining.

Crystallization/ Granulation – honey crystallizes naturally either on storage or even in the combs. This should not be viewed as bad honey. In the event of the above you can liquefy by warming it gently in a water bath.

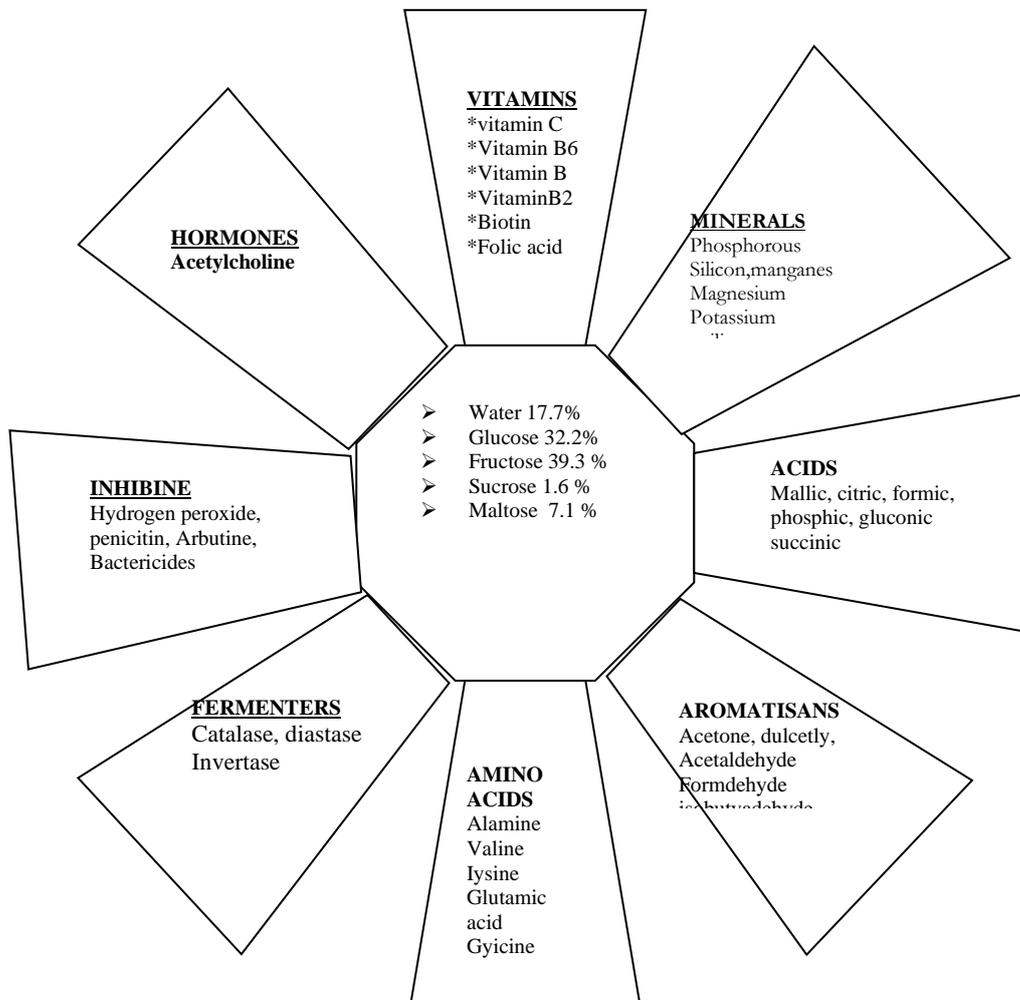
GRADING

This is done according to the moisture content using a hand refractrometer.

THE NATIONAL BEEKEEPING STATION LABORATORY HONEY ANALYSIS PARAMETERS

CHARACTERISTICS	REQUIREMENT
Moisture level	Maximum 20%
Total reducing sugar (glucose and fructose)	Maximum 65%
Sucrose	Maximum 5%
Acidity	Maximum 40mg/kg
HMF	Maximum 40mg/kg

THIS IS WHAT COMMON SUGAR OFFERS US
SUCROSE 90 -100%



Hope that it has been of much help and a source of information.

Jacob Mungai