

Use of Honeybees & their Products

Agriculture

The background features a light grey honeycomb pattern. A large green triangle is on the left, and a yellow triangle containing a close-up of honeybees on a honeycomb is on the right. The word 'Agriculture' is written in white on a green rounded rectangle, with a horizontal line extending to the right.

Contents

1. What is Apiculture?

1.1 Uses of Honey bees

2. Bee products - their properties and uses

2.1 Honey

2.2 Pollen

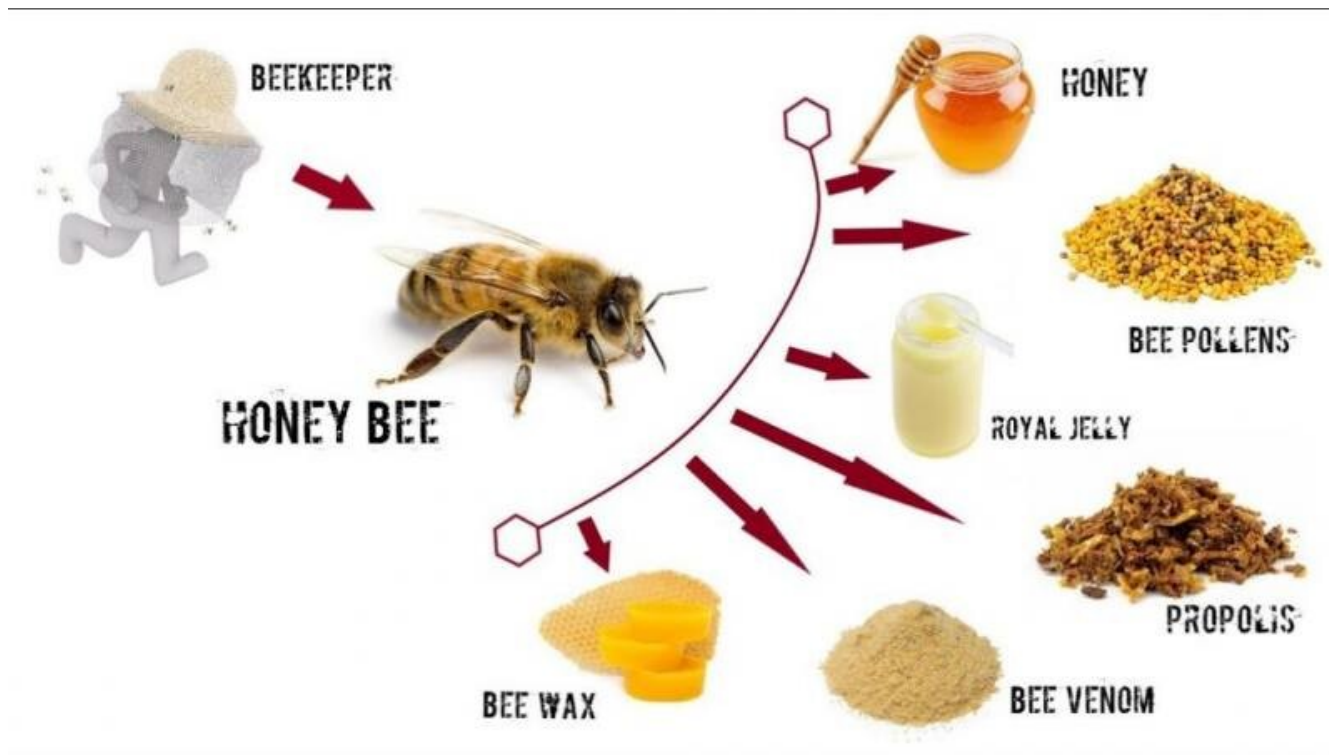
2.3 Royal jelly

2.4 Propolis

2.5 Bee Wax

2.6 Bee Venom

Use of Honeybees and their Products (Agriculture)



1. What is Apiculture?

- Apiculture is the scientific method of rearing honeybees.
- The word 'apiculture' comes from the Latin word 'apis' meaning bee.
- Apiculture or beekeeping is the care and management of honey bees for the production of honey and wax.
- In this method, bees are bred commercially in apiaries, an area where a lot of beehives can be placed. Usually, apiaries are set up in areas where there are sufficient bee pastures – such as areas that have flowering plants.
- Honeybees belong to the family – Apidae; subfamily – Apinae; and genus - Apis.

Use of Honeybees and their Products (Agriculture)

1.1 Uses of Honey bees

- One of the main uses of Honey bees in agriculture is Cross Pollination. The *Apis mellifera* (European honey bee) is responsible for the pollination services in majority of crops.
- The number of colonies of honeybees required per hectare very much depends on the strength of foraging bees in the colony, the crops and prevailing weather conditions.
- The optimum number of colonies of average strength may range from 3 to 9 colonies per hectare, since the bees usually forage within a radius of about 1 to 2 km to harvest their nectar and pollen loads, and then return to their own hive.

Crops benefited by bee pollination

Fruits and nuts	Vegetable and vegetable seed crops	Oil seed crops	Forage seed crops
Almond	Cabbage	Sunflower	Lucerne
Apple	Cauliflower	Niger	Clover
Apricot	Carrot	Rape seed	
Peach	Coriander	Mustard	
Strawberry	Cucumber, Melon	Safflower	
Citrus	Onion, Pumpkin	Gingelly	
Litchi	Radish, Turnip		

Per cent increase in yield due to bee pollination

Crop	Botanical name	Per cent yield increase
Mustard	<i>Brasica sp</i>	43
Sunflower	<i>Helianthus annus</i>	32 - 48
Cotton	<i>Gossypium sp.</i>	17-19
Lucerne	<i>Medicago sativa</i>	112
Onion	<i>Allium cepa</i>	93
Apple	<i>Purus malus</i>	44

2. Bee products - their properties and uses

- Honey
- Bees Wax
- Royal Jelly
- Bee Venom
- Propolis
- Pollen

2.1 Honey

- A sweet, viscous fluid - Produced by honey bees
- Honey is collected from nectar from nectaries at base flowers. Also collected from nectar secreted by plant parts other than flowers known as extra floral nectaries.
- It is also collected from fruit juice, cane juice etc.

Collection and ripening of honey

- Bee draws nectar by its tongue (proboscis)
- Regurgitated by field bees
- Collected by hive bees - Deposited in cells in comb
- Nectar contains 20-40% sucrose
- Invertase converts sucrose into dextrose (glucose) and levulose (fructose)
- Invertase is present in nectar itself and in saliva of honey
- Ripening of honey is by action of enzyme and by evaporation of water by fanning of wings

Composition of fully ripened honey Per cent (Approx.)

- Levulose - 41.0 %
- Dextrose - 35.0 %
- Sucrose - 1.9 %
- Dextrins - 1.5 %
- Minerals - 2.0 %
- Water - 17.0 %
- Undetermined (Enzymes, Vitamins, Pigments, etc.) - 1.6 %

Pigments

Carotene, Chlorophyll, Xanthophyll

- Carotene, Chlorophyll, Xanthophyll

Minerals include

- Potassium, Calcium, Phosphorus, Sodium, Magnesium, Manganese, Copper, Sulphur, Silica, Iron.

Vitamins

- Vit B1 (Thiamine), B2 (Riboflavin), Nicotinic acid, Vit.K, Folic acid, Ascorbic acid, Pantothenic acid.

Physical properties of honey

- Honey is hygroscopic. If exposed to air it absorbs moisture
- Honey is a viscous fluid. Heating of honey reduces viscosity
- Specific gravity of pure honey is 1.35 - 1.44 gms/cc
- Refractive index of honey - Helps to find moisture content measured using refractometer

Purity test for honey

- Measure specific gravity of honey using hydrometer
- If the specific gravity is between 1.25-1.44 it is pure honey

Aroma and flavour of honey

- Acquired from the nectar of the flower
- Lost if heated or exposed to air for long time

Colour of honey

- Depends on the nectar of flower (plant species)
- Darker honey has stronger flower
- Lighter honey has more pleasant smell

Fermentation of honey

- Honey containing high moisture can ferment
- Sugar tolerant yeast present in honey cause fermentation
- Fermentation more at 11-21oC
- Fermentation lends to formation of alcohol and carbondioxide
- Alcohol later converted into acetic acid
- Fermented honey sour in taste due to acidity
- Heating honey to 64oC for 30 min destroys yeast and prevents fermentation

Fermentation of honey

- This is a natural property of honey (particularly at low temperature)
- Dextrose present in honey granulate and settle down
- Levulose and water remain top - More prone to fermentation
- High ratio of Levulose/Dextose (L/D) - Less granulation
- High ratio of Dextrose/Water (D/W) - More granulation

2.2 Pollen

- Pollen is extremely rich in protein. It contains all the essential amino acids, various fatty acids, vitamins B, C, D, E and K, and provitamin A.
- Bees get covered in pollen as they collect nectar from plants, then they enrich it with different ferments, hormones and antibiotic substances, and deposit it in honeycomb cells.



- If we extract these balls of pollen out from inside a honeycomb cell, we get extracted honeycomb pollen or bee bread. If we install a pollen trap at the entrance to the hive, we get trapped fresh pollen. When bees try to squeeze through the wire of a pollen trap, pollen loads fall off their hind legs.
- A few hours prior to ingestion we soak pollen in a glass of water in order that the pollen grains swell up and dissolve. This way pollen is more easily digestible and, at the same time, substances beneficial for the organism are absorbed directly into the bloodstream.
- We can also dissolve pollen in juice or other liquids, and it is also recommended to ingest it with yoghurt or fruit.

2.3 Royal jelly

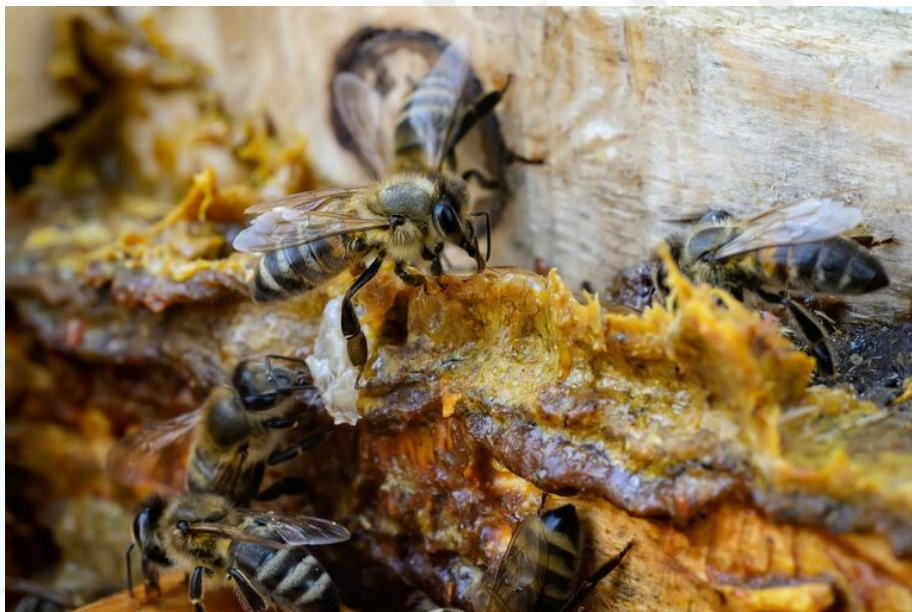
- It is an excellent dietary supplement for the elderly
- Royal jelly is secreted by the glands of young worker bees. Nurse bees feed the jelly to the larvae, which are up to three days old, whereas queen bees live exclusively on it. It is this distinctive food that decides whether a worker or a queen bee will hatch from the larva.
- When the honeycomb cells contain the largest amounts of royal jelly, beekeepers harvest it. Production of extensive amounts of royal jelly is, however, very demanding.
- Royal jelly improves general wellbeing and brain function



- Because it alleviates conditions and inconveniences related to ageing, which, among other things, are connected to a deficient diet, it has proven to be an excellent dietary supplement particularly for the elderly.
- Royal jelly improves general wellbeing and brain function and promotes the healthy functioning of glands.
- We ingest it in small quantities, either fresh or in natural form, or in the form of various preparations. We can mix it with honey, pollen, wax or propolis.

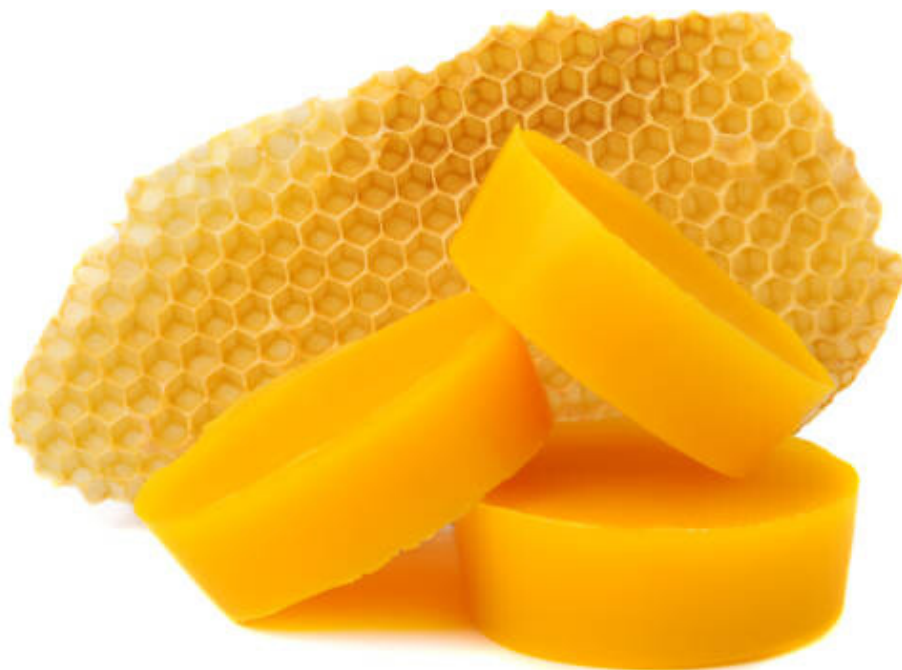
2.4 Propolis

- It is a natural antibiotic
- Propolis in particular is the beehive's very special treasure, because it is a natural antibiotic. Bees collect resin from a variety of trees and shrubs and blend it with pollen pellets while feeding larvae. Over 360 substances have already been found in it.
- Bees coat the inside of the hive with propolis, thus protecting it from moisture, wind and microbes.
- We can use it in the form of alcohol- or water-based solutions or mix it with honey or other drinks (yoghurt, sour milk, tea etc.). We know of various pharmaceutical preparations made with propolis, such as ointments, tablets, injections and solutions that can be used topically.



2.5 Bee Wax

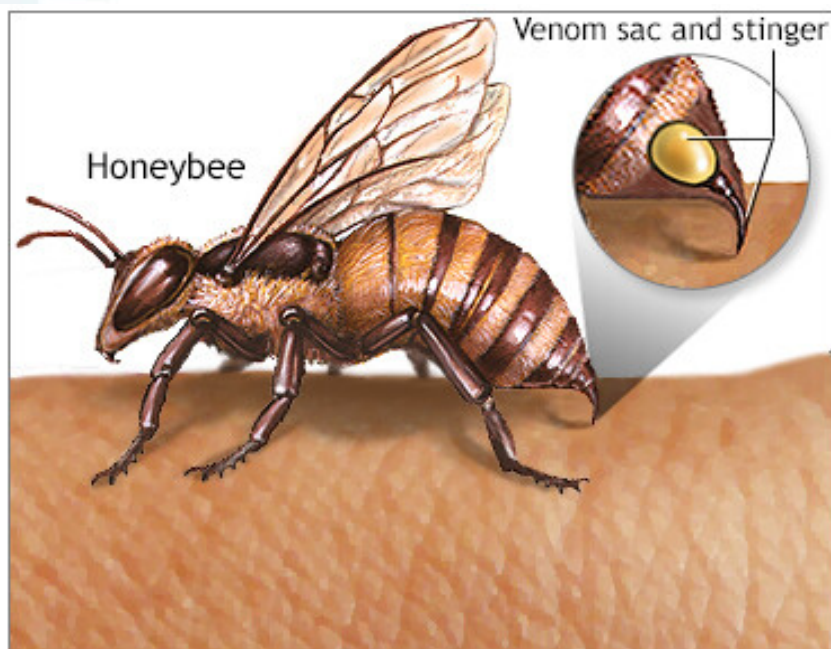
- It can be used for softer and younger looking skin
- Wax is produced by the glands of worker bees, which they need to build the honeycomb and to seal the top of honey-filled cells.
- Chewing vitamin-fortified candy from honey and wax is a fabulous substitute for chewing gum.
- Beeswax contains over 300 natural compounds, among which the main component is fatty-acid esters. Fresh wax is almost pure white, whereas later it turns a yellowish brown colour. It has a pleasant scent reminiscent of honey, propolis and pollen.



- The cosmetics industry loves it. Wax is often added to creams because it makes skin soft and supple and has antibiotic properties.
- The chewing of capping, i.e. the wax covering over honey, is well known, while thermal therapies using beeswax, which are usually carried taken straight after a massage or physiotherapy, are also becoming popular off late.

2.6 Bee Venom

- It is an indispensable ingredient used to desensitise against bee stings
- Most people also know bees for their sting. Bees, however, need a very good reason to sting. If you encounter bees in nature, they will only sting if their life is seriously threatened.
- But in front of a beehive, a different story holds true. There, guard bees diligently perform their duty of guarding the entrance to their home, which not only hosts larvae but also plentiful reserves of honey and pollen. We should therefore never come too close to apiaries or stand in front of hives.
- If we are stung by a bee it is completely normal to have some kind of reaction. In the case of an allergic reaction, however, we should seek medical assistance.
- In medicine, bee venom is used to desensitise people allergic to bee venom. Around the world, bee venom is also used to heal various conditions and illnesses, but such treatment is only possible under medical supervision.
- Lately, bee venom is becoming increasingly popular in cosmetics industry. It is added to creams and serums, since it is supposed to be a natural substitute for Botox.



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