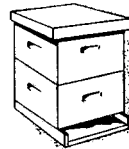


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ESSENTIALS OF BEEKEEPING



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ESSENTIALS OF BEEKEEPING

This circular has been prepared to help the beginner to get started right with bees.

It is important for the beginner to have good beekeeping equipment. However, it is not necessary to have all the extra equipment used by the professional or commercial beekeeper.

The cost of starting with bees is within reach of every North Dakota family, on the farm or in town. With a minimum of expense and time, most individuals can profitably keep a few hives of bees.

Beekeeping makes an excellent 4-H club project, Boy Scout merit badge achievement, father and son hobby or a family project. Many people of varied occupations in North Dakota are now keeping bees as a profession or hobby.

North Dakota is a good place to keep bees. During the past 10 years the state's honey production was approximately 104 pounds per colony of bees, compared with about 50 pounds as an average for the United States.

HOW TO GET STARTED

Visit a beekeeper for a day, if you can, and observe his methods. You will get first hand information that would take weeks to acquire from books or from your own experience. Most North Dakota beekeepers will give an enthusiastic beginner a practical demonstration of their methods. If you don't know of a beekeeper in your county, ask your County Extension Agent, or write to the Bee Division, State Department of Agriculture, Bismarck, N. D. 58501.

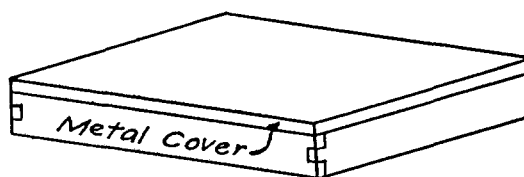
There are several ways to secure bees to get started in beekeeping.

1. **Buy Package Bees:** This is the surest method of getting started properly. Purchase the bees from a reliable source of supply and have them arrive by May 15, in time to produce a good honey crop for the season. Package bees are sold by the pound with one queen and 11,000 - 16,000 workers. Costs are approximately \$20.00 for a 2-lb. package and \$25.00 for a 3-lb. package, plus shipping charges.

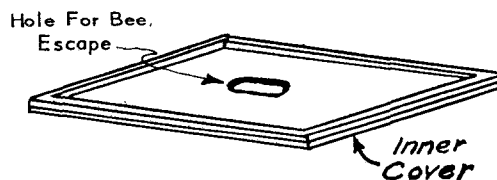
2. **Buy a Hive of Bees from a Local Beekeeper:** This is a good practice if the local beekeeper has extra colonies for sale. However, when purchasing bees or equipment from other beekeepers, be sure to obtain a certificate of health from the Bee Division, State Department of Agriculture, Bismarck, N. D., showing that the bees and equipment are free of disease.
3. **Capture a Swarm of Bees:** This is not always the most profitable means of getting started in beekeeping. Often, you can capture a swarm of bees that has left its colony, or possibly, a local beekeeper may have an extra swarm of bees he may give you. However, most beekeepers try to prevent swarming because it weakens the colonies from which they leave. If you rely on getting your bees from a swarm, it may be too late in the season to get much honey produced that season.

EXTERIOR PARTS OF A BEE HIVE

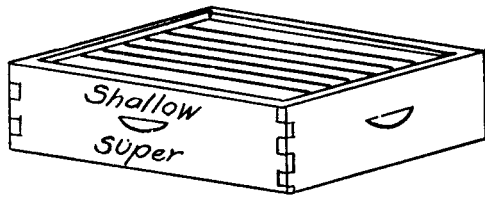
OUTER COVER: Telescopes over inner cover and top of hive.



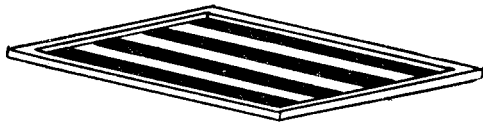
INNER COVER: Made of thin lumber which fits directly on top of the hive body. It has an oblong hole for a bee escape.



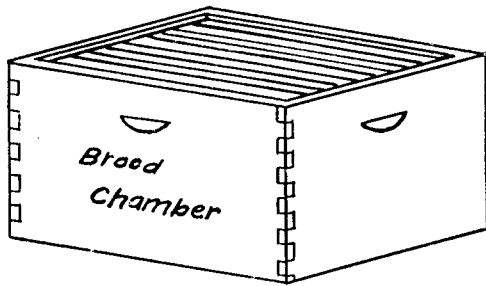
SHALLOW SUPER: Where the surplus honey is stored. At least two or three shallow supers are needed per hive. For ease in handling use only the shallow (5-11/16 inches deep) supers.



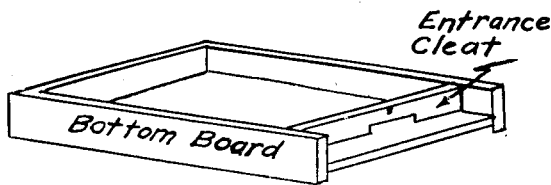
QUEEN EXCLUDER: This excludes the larger queen from laying eggs in the supers but allows the workers to pass through freely to the supers where the honey is stored.



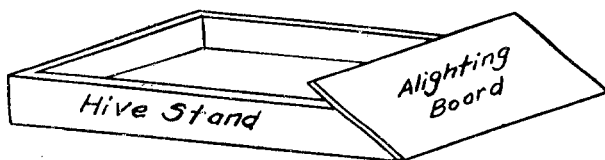
BROOD CHAMBER: This is where the young bees are raised. Two full depth hive bodies are recommended per hive for maximum honey production.



ENTRANCE CLEAT: This reduces the opening of the hive during cold weather or during the time the colony is getting established and prevents chilling of bees and brood chamber. Remove it during the summer. **BOTTOM BOARD** is the floor upon which the hive rests.

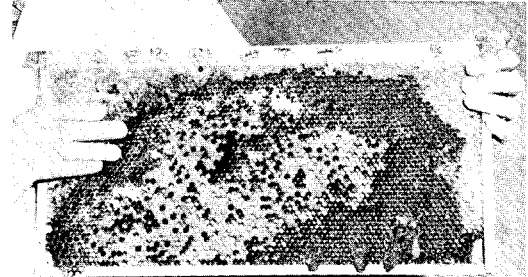


HIVE STAND AND ALIGHTING BOARD: Keeps the hive off the ground. This part of the hive isn't necessary if cinder blocks, bricks or rocks are used to keep hive 3 - 4 inches off the ground.



INTERIOR OF THE BEE HIVE

The modern hive has 10 removable frames in each brood chamber and super. The frames allow examination of the combs at any time without disrupting the colony. The honey crop may also be removed without killing the bees.



Frame of worker brood, honey stores at top, drone cells at side near bottom, queen cells along bottom.

Each frame contains a thin sheet of pure beeswax called foundation. These thin sheets of foundation have the imprints of ordinary honey-comb. The bees work this foundation into natural comb or cells for raising their young and for storing honey and pollen. Without foundation of the worker size comb, the bees would build their own irregularly shaped natural comb, much of it being drone comb and of no value to the beekeeper in honey production.

With two or three colonies of bees, it is best to produce chunk honey on thin foundation. Thin foundation permits the honey to be cut out of the frame in squares or chunks and eaten with the wax. If thick foundation were used in chunk honey production, the excessive amounts of wax in the honey would be objectionable. In chunk honey production, no extracting equipment is needed.

All foundation should be wired. The thin wire is embedded into the foundation by means of a wiring board and spur embedder. Wire strengthens the combs so they can be handled with less breakage. The wiring also prevents stretching and distortion of the cells, which frequently occur to unwired combs during warm weather.

For the beginner, it is better to use the shallow supers because they are much easier to handle after they have been filled with honey. The average weight of a shallow super filled with honey is about 40 pounds, compared with 75 pounds or more for the full depth supers used by the commercial beekeeper.

EQUIPMENT FOR HANDLING BEES

In addition to the hives with frames and comb foundation, the beekeeper needs tools for handling the bees.

BEE SMOKER: Used to quiet the bees when working around the hive. It consists of a tinder box with an attached bellows. Slow burning fuel, such as old burlap, cotton rags, or dry rotted wood, produces a cool, dense smoke and is best to use.



(Courtesy "Gleanings in Bee Culture".)
Using smoker to quiet bees.

HIVE TOOL: A flat chisel-shaped piece of steel used in separating the parts of the hive and wide enough to pry the frames apart so they may be removed easily. It is bent at one end for use as a scraper to remove beeswax.

BEE VEIL: Protects the face from bee stings and is made so it can be pulled over the head and around the neck of the wearer. The black wire mesh folding veil is recommended. Cloth veils are soft and do not always keep bees away from the face.

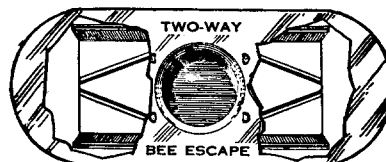
BEE GLOVES: Special canvas gloves with long sleeves provided with an elastic band give the beginner a sense of security and may be used the first few times a hive is opened. Once you have gained confidence in yourself, use gloves only when removing surplus honey. Gloves interfere with handling equipment.

BEE ESCAPE: An oblong metal device with two pairs of light delicate springs so sensitive they allow

the bees to pass through with a slight pressure against the springs. After the bees pass through, the springs prevent the bees from returning. The bee escape is used to remove bees from surplus honey. It is placed in the opening of the inner cover and the inner cover is placed between the brood chamber and the supers. Bee escapes should be put on at least a day before the removal of the supers containing the honey crop.



(Courtesy American Bee Journal.)
Opening a hive of bees.



HOW MANY HIVES?

Start with one or two and not more than three colonies of bees. The first year you will learn to handle bees, gain practical experience, and find out if you enjoy and have sufficient time to devote to beekeeping. After a year or two of experience you may wish to increase five or 10 colonies and buy extracting equipment for the production of bulk honey.

COST OF GETTING STARTED

One complete new hive, with bees and necessary equipment for handling, will cost about \$125.00. Each additional hive will cost about \$100.00. The second year, each hive will cost from \$20.00 to \$25.00 for package bees and foundation for the production of chunk honey.

Based on the average production for North Dakota, you can expect between 33 - 40 percent return on your initial investment the first year.

Beginning beekeeper sets can be purchased for approximately \$55.00 - \$60.00. These sets include one hive body, the bees, essential equipment for handling bees and a book of instructions. The sets do not include supers for storing honey or an extra full depth brood chamber which allows the colony to build up their numbers in a two story hive. Some beginners have ordered these beginners sets and then had to order additional equipment for the storage of honey. For maximum production of honey, each hive should have one additional brood chamber and at least two additional shallow supers.

INHABITANTS OF THE HIVE

The average colony of bees during the summer contains three castes of bees—the queen, a few hundred drones, and 50 to 70 thousand workers.

THE QUEEN

The queen is the mother of the colony. During the brood rearing season, she may lay several thousand eggs in the cells of the combs. Although the queen is the most important individual in the hive, she is in no sense the governor. After the queen lays her eggs the young are cared for by the workers.

The queen produces both fertilized and unfertilized eggs. The fertilized eggs, deposited in the smaller worker cells (5 to the inch), produce the worker bees. The unfertilized eggs placed in the larger drone cells (4 to the inch) produce the drones or male bees. An improperly mated, infertile queen can, therefore, produce only the drones and is of no value to the beekeeper.

The merits of a good queen can readily be determined by the uniformity with which she lays her eggs in the combs.

Queens may live up to 3 or 4 years; however, most beekeepers find it desirable to change queens every 2 years.

Number of drones may be kept to a minimum by using full sheets of wired worker foundation in the frames of hives. This causes the bees to build combs consisting largely of worker size cells.

The queen is of the same origin as the worker bee. Her specialization is brought about by a special diet known as royal jelly which is fed to her during her entire larval period by nurse bees. She is produced in a large peanut-shaped cell which projects downward from the base instead of being horizontal as are worker and drone cells.

THE DRONE

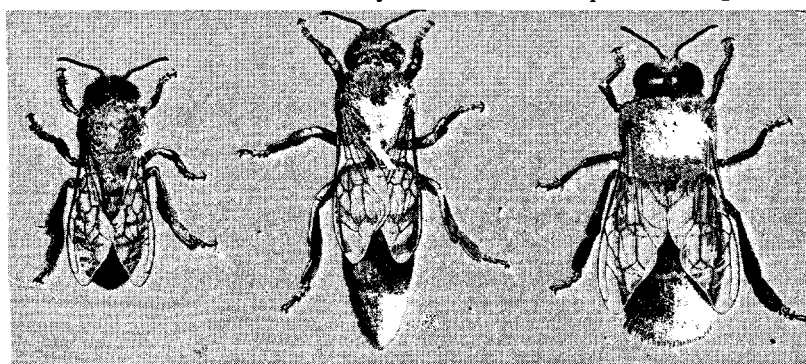
The drone is the male bee whose sole function is to fertilize the queen. He is larger, stouter and heavier than the worker but not quite as long as the queen. During the summer a normal colony will contain several hundred of these big, noisy fellows. They do not work but live entirely upon the toil of the worker bees. At the end of the honey season the workers drive the drones from the hives to die.

THE WORKER

The worker bee is a modified female whose reproductive organs are not fully developed. The worker bee larvae is fed royal jelly only during the first two days of her larval existence. After that she is given a diet of honey and pollen called "bee bread". A normal colony contains 50,000 or more workers. They perform all of the labor of the hive in a definite sequence. For the first two weeks of their lives they are called "hive bees", because they remain in the hive devoting their energies to cleaning cells, caring for the brood, ventilating the hive, evaporating nectar, building comb and acting as guards. After two weeks they take up the duties of field bees, carrying water and gathering pollen and nectar.

DEVELOPMENTAL STAGES OF BEES

To obtain the greatest amount of honey the largest number of field bees should be in the hive at the time nectar-producing plants come into bloom. Therefore, a knowledge of the life history is important so a large force of field bees is available in time for the honey flow. All bees pass through four



Worker

Queen

Drone

Each of these bees differs in size and shape.

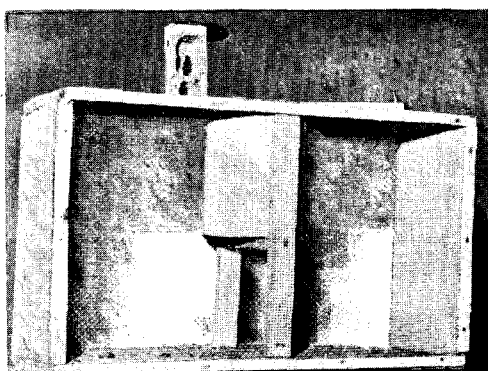
stages in the course of the life cycle: (1) The egg, (2) the larva or worm stage (period of growth), (3) the pupa, which is the resting stage and period of transformation to a winged form and (4) the adult. The time the bee spends in each of the four stages is given in the following table:

Development Period in Days

	Egg	Larva	Pupa	Total
Queen	3	5½	7½	16
Worker	3	6	12	21
Drone	3	6½	14½	24

LIFE OF AN ADULT

Queen 3, 4 or several years
 Worker 6 weeks summer, 6 months winter
 Drone Several weeks to months (summer only)



Shipping container with feeding can and queen cage.

CHOOSING A LOCATION

In choosing a location for the hives select a site within 1 to 2 miles of nectar producing plants, especially sweet clover. An ideal location is a south or southeastern exposure with the hives protected from the cold north wind by a shelterbelt of trees. Place the hives near a good supply of fresh water. If water is not provided, the bees will find their own source. Water may be supplied by using a pan with bits of wood or stones placed in it to keep the bees from drowning. Replenish the supply of water every few days or as needed.

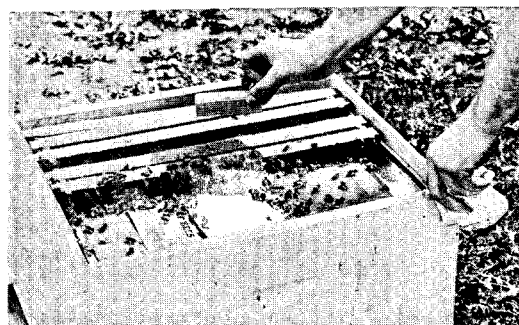
INSTALLING PACKAGE BEES

The 3-pound package is recommended for getting started in the spring. Package bees may be purchased from bee supply houses listed in this circular and also as listed in bee journals. Order your bees so as to arrive about May 15. Before the bees arrive assemble the hive and place it in the area where you plan to carry out your beekeeping operations. Place five of the frames into the brood chamber. Leave one side of the brood chamber empty in order to have sufficient room to place the shipping container. Reduce

the entrance to the hive to 1 inch by placing the entrance cleat into position. Package bees are shipped in wire cages (see illustration) with the queen and a few worker bees enclosed in a separate queen cage. Detailed instructions for releasing the queen and installing the bees are furnished with the order.

The procedure for installing package bees into a hive is as follows:

- (1) Mix 10 pounds of granulated sugar in 1½ gallons of warm water and gorge bees by liberally smearing or sprinkling syrup over cage about 30 minutes before releasing them into the hive. This makes them quiet.
- (2) Pry off wood cover and remove the queen cage. Check to see if the queen is alive. If queen is injured or dead, write to your supplier for a replacement which will be sent free of charge. A small cloth plug may be pushed in the space left by removal of queen cage to prevent the bees from escaping from the screen cage.



- (3) Remove cork or plug that covers candy hole in end of queen cage. With a small nail or match push a hole through the candy. This will help the bees in releasing the queen from her cage. Hang queen cage between top bars of middle frame.
- (4) Remove feeding can by tilting shipping cage and pulling out. Shake some of the bees over the queen cage in hive. Remove the remaining bees in shipping cage by setting package opening up in empty space in hive or by shaking balance of bees into the hive. If this shipping container is left in the hive overnight it should be removed the next morning. Shake any remaining bees into the hive and replace the five missing frames.
- (5) Put on inner cover and invert the perforated feeding can full of sugar syrup over opening in cover, after punching a few more holes. Better yet, use a 5-pound friction lid pail with the lid perforated with 20 or more holes

punched with a three-penny nail. The larger pail will not require as frequent filling as the small feeding pail that comes with the package bees.

- (6) Put on empty hive body and outer cover.
- (7) Leave the bees unmolested for at least seven days except to refill feeder can. After seven days, examine the frames to be sure that brood is developing. If the queen does not start laying and there is no brood write or call your supplier for a replacement (you rarely have faulty queens). Depending upon the season, you might have to feed the bees three and up to four weeks if bad weather prevented them from bringing in nectar and pollen. Continue feeding until the bees are storing honey or rearing brood in all but the outside frames. At this time put on the queen excluder and one super and increase the size of the opening at the entrance of the hive.

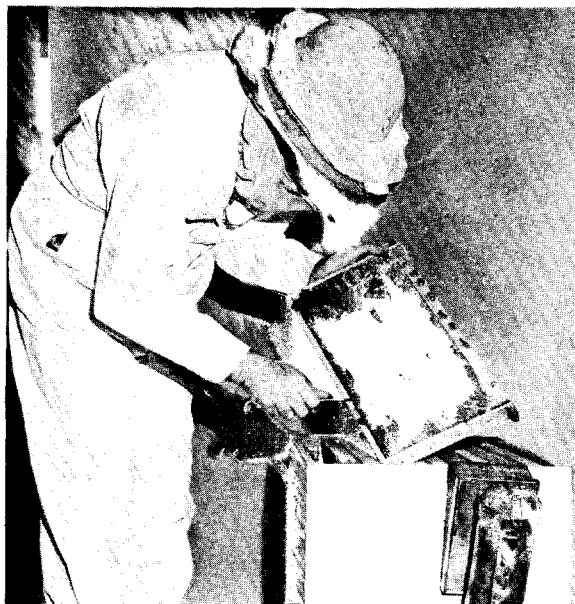
OPENING THE HIVE

Only a bee veil and gloves need be worn when transferring package bees to the hive or when refilling the sugar syrup pails. However, when disturbing the interior of the hive, always wear protective clothing. Wear loose, light-colored clothing - avoid black or fuzzy materials. Tuck the trousers into the socks or tie about the ankles.

Light the bee smoker, put on the veil and protective gloves, then stand out of line of flight and puff a little smoke into the hive entrance. Lift off outer telescoping cover and blow two or three puffs of smoke down through the bee escape hole. Gently pry up inner cover with hive tool and gently blow a few puffs of smoke over the combs. After the cover has been leaned against the rear of the hive, use the curved end of the hive tool as a pry between outer wall of hive and outside frame to loosen the frames. Lift out outer frame and lean against cover. You will now have ample room to remove and examine the brood combs to determine amount of pollen and honey and the presence of eggs, brood and queen cells.

EXAMINE THE HIVE REGULARLY

Examine each colony of bees every seven to 10 days. To prevent swarming, remove queen cells or destroy them by crushing. Be sure there is an abundance of empty combs in the supers to store honey and that the brood is all right.



Examining a colony of bees and destroying the queen cell by crushing.

SEASONAL MANAGEMENT

Give the bees ample space, with at least two supers for the storage of honey in the hive at all times. When the frames are capped they can be removed from the super and replaced with empty frames with thin foundation.

LATE SUMMER MANAGEMENT

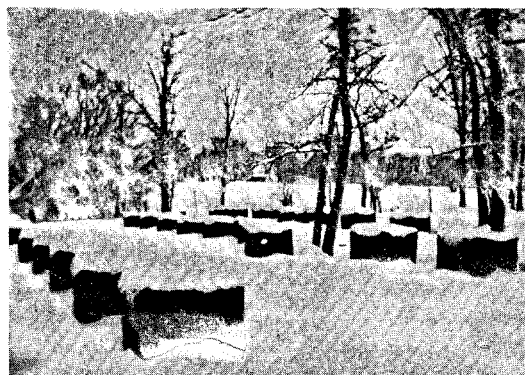
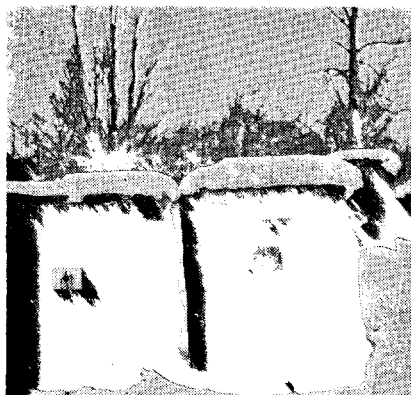
The beginner will undoubtedly wish to keep his colony overwinter. However, if you plan to replace with package bees the following season, locate and destroy the queen about the middle of August. By the first week of September all of the brood will have emerged, leaving drawn combs. Depending upon the season, by mid-September or early October, after honey production has stopped, the rest of the bees may be shaken from the comb. Select a cold evening for this procedure. Only the commercial beekeeper (300 or more colonies) uses cyanogas, which is extremely toxic and impossible for the layman to obtain. The honey can be left in the brood chamber for use by the bees the following spring. If there is a good storage of honey in the brood chamber, supplementary feeding with sugar syrup may not be necessary the following spring. The equipment should be stored in a bee tight room to prevent robbing from other bees and keep it free from mice.

FALL MANAGEMENT

If you plan to overwinter, the food chamber (two story hive) should be left intact and should have 60 to 70 pounds of honey. Most of the honey should be toward the top so the bees can move upward into their food supply during the winter.

PACKING BEES FOR WINTER

Unlike most insects, honey bees remain active during the winter season, eat honey to provide heat, and save heat by clustering when the temperature drops to 57 degrees inside the hive. The hives should be protected by wrapping tar paper around 3 or 4 inches of dry leaves or straw. Pack three sides and face the hive to the south with the front of the hive covered only by black tar paper to absorb heat. The entrance cleat is reduced to the smallest opening. Bore a 3/4 inch hole in the upper entrance just below the hand grooves. This allows moisture to escape and provides the bees an exit for cleansing flights on warm days.



SPRING WORK

Brood rearing starts in the late winter or early spring and the hive can be opened when the temperature reaches 70 degrees. At this time check to see if the bees have sufficient food and brood. If there is no brood, the colony is probably queenless and a new queen should be ordered at once. If food supplies are nearly exhausted, begin supplementary feeding, using one part sugar to one part water as with package bees. Continue this feeding until the bees start bringing in pollen and nectar from spring flowers.

OVERWINTERING VERSUS PACKAGE BEES

If you consider the 5 to 10 percent loss, 50 to 60 pounds of honey consumed per hive, and the cost of

labor of packing and caring for the bees, you may feel that it is probably more economical to order package bees each spring. After the first year you will have stores and drawn comb in the hives and will not have to feed them if you have a normal fall honey flow.

PRODUCTS OF THE APIARY

There are three kinds of honey: **Comb**, **extracted** and **chunk honey**. Comb honey is stored to box-like frames called sections. Strong colonies and special care are needed to produce comb honey. Its production is not recommended for the beginner.

Extracted honey is that which is removed from the comb.

Chunk or bulk comb honey is the easiest kind for the beginner to produce. It is either cut from sealed combs, put in jars with extracted honey poured over it or drained and placed in glass or plastic containers. Its production involves no extra equipment.

Beeswax is another valuable by-product of honey production. The inspector of apiaries who will examine your colonies, usually once a year, will advise you on its preparation.

HONEY EXTRACTION

Three simple methods of obtaining extracted honey are described here. (1) Crushed and incompletely capped combs can be placed in a water bath or double boiler. The beeswax melts at 143 to 145 degrees F., releasing the honey which floats to the top. This is about as warm a temperature as the hand can stand. If heated beyond this point, the honey will darken and lose its flavor. Cool rapidly to 70 degrees F. and the solidified cake of beeswax can be removed. (2) Crush and strain through three or four thicknesses of water-dampened cheesecloth in a warm room (near 90 degrees). Honey is more fluid at higher temperatures. (3) Squeeze chunk comb honey through four thicknesses of dampened cheesecloth or hang the crushed comb in a cheesecloth bag of four thicknesses and let the honey drip into a pan. The room temperature should be near 90 degrees F.

Honey is a food and must be kept clean. The place you do your extracting and packaging should be clean at all times.

BEE DISEASES

Three diseases attack bees in the larval stage - American foulbrood, European foulbrood, and sac brood. American foulbrood, a bacterial disease, is the most important. This disease is kept down through regulations and examinations by the State Inspector of Apiaries.

LAWS AFFECTING BEEKEEPING

Colonies of bees in North Dakota are required to be licensed. Bee inspection is administered by the State Department of Agriculture, Bee Division, 601 Capitol Building, Bismarck, North Dakota 58505. The cost of a license depends upon the number of colonies kept by the beekeeper. For the beginner with less than 10 hives the fee would be \$1.00. This license entitles the beekeeper to one free inspection per year.

When the bee inspector checks your colonies, spend some time with him. He can help you in your beekeeping project. Ask questions. Talk over beekeeping problems with him.

BEE STINGS

If you work with bees you will be stung occasionally. Be deliberate and avoid quick movements and do not swat at an offending bee. Avoid being stung by opening the hive on a warm sunny day when the bees are busy and never disturb them during cool chilly cloudy or rainy weather when they are not bringing in nectar and pollen. If a colony appears cranky and is not quieted by smoke, close it up and wait for another day when the bees are better natured.

When a bee stings it must take a firm hold with its claws; on feeling this you can brush off or kill the stinging bee before the sting penetrates the skin. Upon stinging the sting and poison and poison sac

are torn loose and the barbs keep working, allowing the sting to penetrate deeper. Remove the stinger immediately by scraping with hive tool, thumb nail or knife. Don't use your fingers to pick it off or you will squeeze more venom into the wound from the poison sac.

There is no cure for the bee stings and medical applications are useless because the puncture is too small to admit medicine. Do not rub the wound as it will only cause itching and swelling. If severely stung several times, hot clothes frequently applied relieves the pain and swelling. Fortunately, individuals hypersensitive to the sting are not common. However, if the skin becomes blotched and the breath shortens, a doctor should be called immediately. Adrenalin administered by a physician is an antidote.

Beekeepers acquire immunity to stings, and the itching and swelling become less pronounced so that the operator thinks no more of a bee sting than a scratch from a thorn or a mosquito bite.

FOR MORE INFORMATION

Bee Supply Companies: Dadant and Sons, Hamilton, Ill. 62341; Walter T. Kelly Company, Clarkson, Ky. 42726; A. I. Root Company, Council Bluffs, Ia. 51501; Leahy Manufacturing Company, Higginsville, Mo. 64037, and farm supply departments of mail order houses.

If you are interested in bees, one or both of the national publications on beekeeping will be helpful. They are "Gleanings in Bee Culture", Medina, Ohio 44256, and the "American Bee Journal", Hamilton, Ill. 62341.

"Effects of Pesticide on Honey Bees", Circular E-494 Rev. June 1975 by Dean K. McBride, Extension Entomologist, North Dakota State University.

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Appreciation is also expressed to Melvin Fischer, State Inspector of Apiaries, Bee Division, State Department of Agriculture, Bismarck, North Dakota for reviewing the manuscript.