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ABSTRACT

The study guide contains introductory level information, principles and management practices which may be applied by a hobbyist or a commercial apiary. The lessons are designed to train students for entry level jobs, to establish students in a beekeeping enterprise, and to emphasize the importance of honey bees in our daily lives and in agricultural production. Topics to be considered include: the honeybee and her products, colony organization, housing and equipment, bee selection, apiary location, hive management, diseases, honey production, and laws and regulations. Each lesson plan includes activity, information, and project sheets, glossary and references, quizzes, and answer sheets. The study guide is intended to supplement community resources, on-the-job training, and provide the student with performance objectives during classroom instruction. (Author/MW)

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APICULTURE

Student Guide

CURRICULUM MATERIALS FOR AGRICULTURAL EDUCATION

Agricultural Education, Division of Vocational Technical Education, College of Education, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061

In Cooperation With

Agricultural Education Service, Division of Vocational Education, State Department of Education, Richmond, Virginia 23216

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February 1974

INDIVIDUALIZED STUDY GUIDE

ON APICULTURE

Curriculum Materials
for
Agricultural Education

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1974

FOREWARD

The Individualized Study Guide on Apiculture is prepared for students at all grade levels of a vocational education program in agriculture education. The material is presented in such a manner as to develop an understanding of honey bees and apiary operations. By performing learning activities and completing projects, the student is afforded a means of applying the knowledge he has learned.

The teacher may use the study guide as a basis for group study, practical application, or individualized instruction. The teacher is responsible for directing the study and learning program of the student; however, the student should be the self-motivator to accomplish the activities and projects.

The Individualized Study Guide on Apiculture assists the student of agricultural education to solve the problems which a beekeeper may encounter whether the apiary be a hobby or commercial operation.

ACKNOWLEDGEMENTS

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Appreciation is also expressed to Charlotte Mattson and Claudia Tolsma for typing the final draft of this publication.

TABLE OF CONTENTS

ACTIVITY SHEET I

THE HONEYBEE AND HER PRODUCTS

OBJECTIVES

I. After studying the information sheet and related material,

A. The student should be able to select a suitable location to use when starting his apiary by recognizing the plants in his area which are useful to bees.

B. The student should be able to explain how a honey bee changes nectar of plants into honey and wax when asked by a beekeeper, or an interested person.

C. The student should be able to explain to his class in five minutes or less, the role of the honey bee in pollination of plants, and why pollination of plants is important to farmers.

II. After studying this lesson, the student should be given the opportunity to begin preparation for entering the apiculture business.

PROCEDURES

I. Study Information Sheet 1. If the student experiences difficulty with this lesson, he should read the references for the lesson before asking the teacher for help.

II. When the student has studied the information sheet thoroughly:

A. View the film, "Honey Bee," 10 minutes, B&W, 1940, which may be obtained from the Virginia Film Library.

B. Answer the following questions:

1. How does the worker bee of the colony change nectar of plants into honey or wax?

2. What does "pollination" mean?

3. What is the role of the honey bee in pollination of plants?

4. What effect does the number of bee visits to a plant blossom have on the fruit yield of the plant?

5. If you were entering the beekeeping business and were intending to buy bees, what race of honey bee would you purchase?

6. What kinds of flowers which grow in your area do bees visit to obtain nectar or pollen or both?

INFORMATION SHEET I

THE HONEY BEE AND HER PRODUCTS

A. Honey bee

1. Number of honey bees in Virginia
   a. Colonies - 103,000 in 1968, 45,000 in 1972
   b. Honey production - about 2,266,000 pounds
   c. Every county in Virginia has honey bees
2. Jobs within the hive
   a. Honey bee is a social insect
   b. Bees depend upon each other for life
   c. Honey bee ranks survival of the colony as his first job
   d. Individual bees exist for the good of the colony
   e. Job of the worker bee
      (1) To feed and groom the queen
      (2) To feed the developing bees of the colony
      (3) To gather nectar and pollen
      (4) To defend the home, the stores and the young
      (5) To secrete wax and construct comb
      (6) To change nectar into honey
      (7) To evaporate water from unripened honey
      (8) To cool the hive
      (9) To clean the hive
      (10) To store honey in the comb
      (11) To seal the honey cell where the ripe honey is stored
3. Purpose for keeping bees
   a. Honey for sale

b. Honey for home use.

c. Beeswax for sale

d. Sale of queen bees

e. Sale of package bees

f. Pollination of crops on the farm which is the most important benefit of bees

B. Races of honeybees

1. German bee - characteristics:

a. A black-colored bee

b. An unwanted tendency to swarm often

c. An unwanted drive to leave the comb when the hive is disturbed

d. More likely to sting

2. Caucasian bee - characteristics:

a. Is black with gray bands on the abdomen

b. Is gentle and calm when honey is being taken

c. Gathers more propolis (bee glue) than is necessary

d. Is not resistant to European foul brood disease

3. Italian bee - characteristics:
(Recommended by the U.S. Department of Agriculture for beginning beekeepers)

a. Most popular honey bee race in the United States

b. First imported into the U.S. in 1859

c. Yellow with dark yellow to orange colored bands on the abdomen

d. Gentle, and calm when honey is harvested

e. Good honey producers

f. Strong, early breeders to produce young bees in the spring

g. Hard working bees

4. Carniolan bee - characteristics:

    a. Similar color markings to the Caucasian honey bee- blackish

    b. Gentle when honey is harvested

    c. Strong breeders in the spring

C. Characteristics and Habits of the Honey bee

1. Limits feeding range from the hive

    a. Most bees range within 500 yards of the hive

    b. Many bees feed within 100 yards

    c. Most often bees feed within 10 yards of the hive

    d. The worker bee may make a dozen trips in a day to gather nectar

2. Selects plant blossoms by color

    a. Bees prefer a yellow-green blossom on plants from which to gather nectar

    b. Flowers have ultraviolet patterns of color which are visible to insects

    c. Flowers which appear black to man may appear yellow to the honeybee

3. Is an industrious insect

4. Pollinates a wider variety of flowers than any other insect

5. Keeps its visits to one kind of plant for each nectar gathering trip

6. Collects and distributes a great amount of pollen

7. Is the most valuable insect for cross-pollinating crops

8. Produces the queen bee in a queen cell

9. Gives information such as direction and distance to nectar supplies to the colony members

10. Feeds on honey, pollen, and water

11. Has taste organs in their antennae, tongue, and front legs

12. Smells with antennae

13. Prefers nectar which is high in sugar

14. Is attracted to blossoms which appear yellow-green to the honey bee

15. Lives in a colony as a means of survival

16. Has a hairy body which becomes piled up with pollen as the bee flies from plant to plant

17. May be moved to any location to concentrate bee pollination activities in an area where plants need to be fertilized to increase production

18. Swarms when the colony becomes too strong with worker bees

19. Becomes calm when smoke is pumped into the hive

D. Pollination

1. Definition

a. The act of uniting pollen from the anther to the stigma or to an ovule of a plant to produce fruit or seed on the plant

b. The act of fertilizing plants so that fruit or seed may be produced by plants

2. Role of the honey bee in pollinating plants

a. Honey bees collect a wide variety of pollen from plants

b. Honey bees visit a wide variety of plants thereby increasing the possibility of cross-pollination

c. Honey bees visit each plant several times

d. Honey bees maintain, to the benefit of man, about 50 agricultural crops by their pollination activities

e. Honey bees may be controlled to pollinate crops

f. Plants which are fully pollinated by honey bees have the potential for producing more fruit or seed

3. Honey bees generally search for nectar within 500 yards of the hive

4. Honey bees are stimulated to pollinate a plant by the:

a. Taste and sugar content of the nectar of the plant

b. Physical and chemical conditions of soil in which the crop is growing to include the pH level of the soil

c. Color of the blossom of the plant as it appears to the bee

d. Type of plant, legume or grass

5. Honey bees are important to pollinate agricultural crops for production of seeds and fruit

6. Crops from which honey bees like to collect nectar or to pollinate:

   a. Cucurbits - cucumbers, squash, watermelons, and cantaloupes

   b. Alfalfa

   c. Clovers

   d. Citrus fruits - oranges, apples, peaches

   e. Berries

7. Productive pollination occurs when:

   a. The bee population at mid-morning is one bee per one-hundred blossoms on cucurbit plants

   b. The bees visit each blossom on cucurbit plants from eight to twelve times

   c. The bee population is one hive per acre of cucurbit plants

   d. The bee population is two or three bees per square yard of alfalfa

   e. The bee population is four or five colonies per acre of alfalfa

   f. The population of bees is three to five colonies of commercially rented bees per field of crop when the bees are distributed in the field

   g. The spraying of crops with pesticides is coordinated to prevent damage to honey bees.

   h. The nectar contains 50-75% water.

8. Honey bees account for about eighty percent of agricultural crop pollination

9. Honey bees visit plants several times

   a. The first visit lasts 36 to 39 seconds

   b. The other visits may last 15 seconds or less

10. Honey bees may be used to "flood" crops to promote maximum pollination

    a. "Flooding" is planning pollination of the crop by locating the bees near the crop to be pollinated

    b. "Flooding" is managing the bee to insure that pollination is accomplished

11. Conditions affecting the honey bees' potential to pollinate crops

    a. Cold weather and rain reduces the activity of bees

    b. Shortage of rain reduces the bees' pollinating activity

    c. Sandy soils reduce the pollinating activity of bees

    d. Extreme variation of soil pH level, above pH of 8 and below pH of 6, reduces the bees pollinating activity

E. Honey

1. Honey is a sugar solution in water which has been modified by enzymes and stored in comb

2. Plants from which the nectar is collected make a difference in the flavor, color, and crystallization of the honey

3. Honey is food for bees

4. Honey is a source of energy for bees

5. Honey is mixed with pollen by the worker bees and fed to the immature bees

6. Honey is used by bakeries to make breads and pastries

7. Honey which has been ripened by the bees contains less than 18% water

8. Honey has 95% of the sweetening power of table sugar, and 82% as many calories as table sugar

9. Honey has the following chemical makeup:

    a. Water - 17 to 18%

    b. Simple sugar - 75 to 77%

    c. Mineral - 0.18%

    d. Miscellaneous - 5.3%

F. Beeswax

1. Manufactured from honey by worker bees

2. Secreted by four pairs of glands on the underside of the abdomen of the worker

3. Is a white substance used for making comb

4. Takes from six to nine pounds of honey for workers to produce one pound of wax

G. Propolis

1. Is bee glue

2. Is collected from buds of trees or pitch of coniferous trees

3. Is used to cover walls in the hive, to fasten frames, to reinforce the comb, to plug holes, to close off the entrance, and to seal off larger animals which workers cannot remove from the hive

PROJECT SHEET I

THE HONEY BEE AND HER PRODUCTS

NAME OF PROJECT - Project I

Constructing a Boardman Feeder

MATERIALS

One quart Mason jar (regular mouth with a top) and three wooden blocks 6" long x 4" wide x ½" thick

PROCEDURE

1. Cut three 6" x 4" x ½" blocks from fir or white pine stock
2. Cut a rabbet ¼" deep and the width of the top of the Mason jar
3. Cut one of the rabbeted blocks to 5" long
4. Glue the two rabbeted blocks together with water-proof glue with the two rabbets facing each other with one end of the blocks flush
5. Cut the remaining block to four inches in length
6. Glue the third block on top of the other blocks with all three blocks to be glued flush on one end

7. Use an expansion bit set to drill a hole slightly larger than the top to the jar.

8. Drill the hole through the top two blocks so that the sugar syrup will run from the jar into the rabbeted broove in the block of wood.

9. Punch small holes in the top of the jar to allow the syrup to run over slowly as the bees eat it.

10. Fill the jar with a solution, two parts sugar to one part water, by volume.

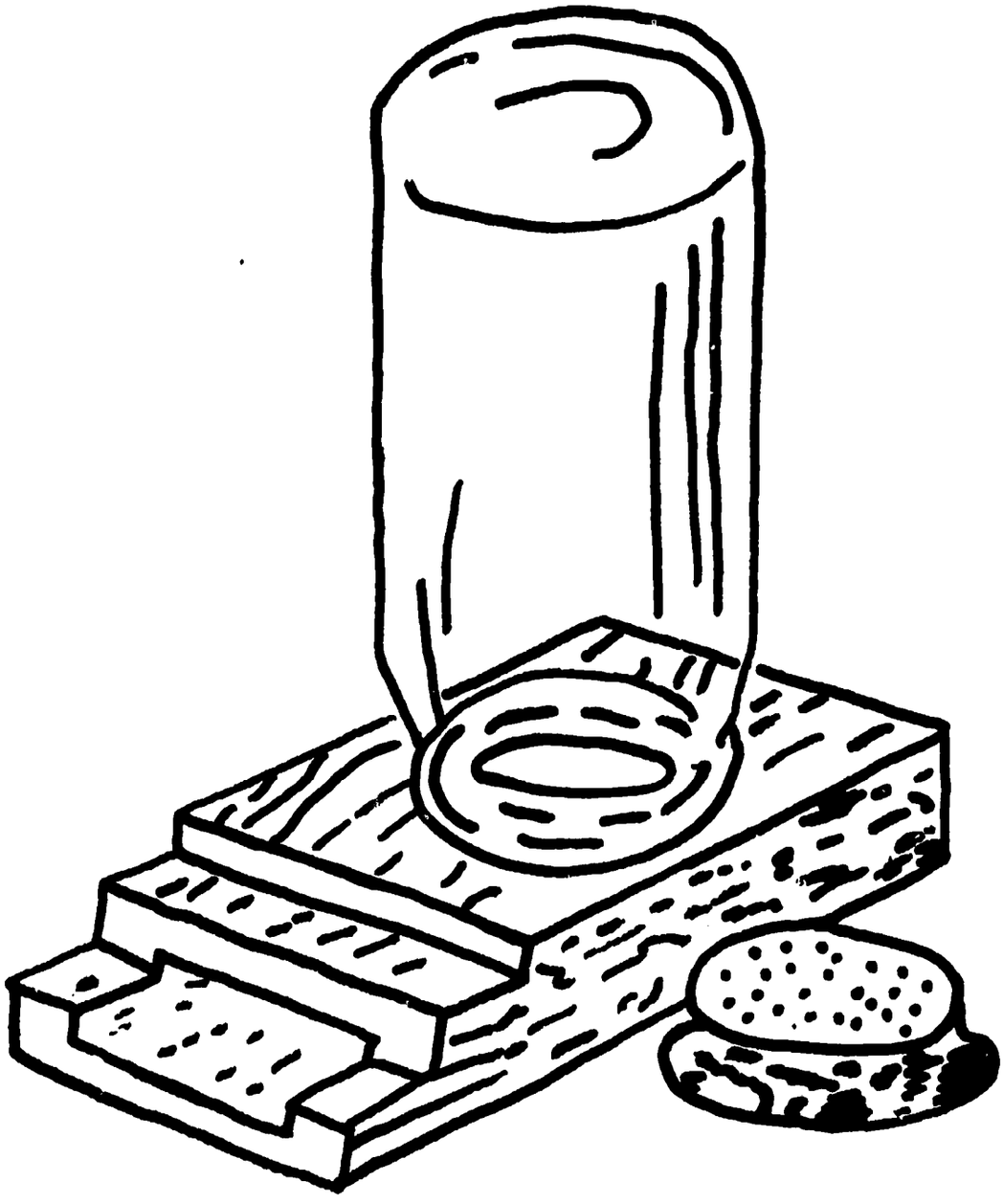
11. Place the top on the jar.

12. Place the block on top of the jar.

13. Insert the feeder into the hive by turning the jar upside down and placing the long end of the block in the entrance to the hive.

14. Observe the rate at which the bees eat the syrup. (How long does it take the bees to eat a quart of sugar water solution?) _____days_____hours_____minutes.

BOARDMAN FEEDER



PROJECT SHEET I

THE HONEY BEE AND HER PRODUCTS

NAME OF THE PROJECT - Project 2

Identifying the functional parts of the honey bee

MATERIALS

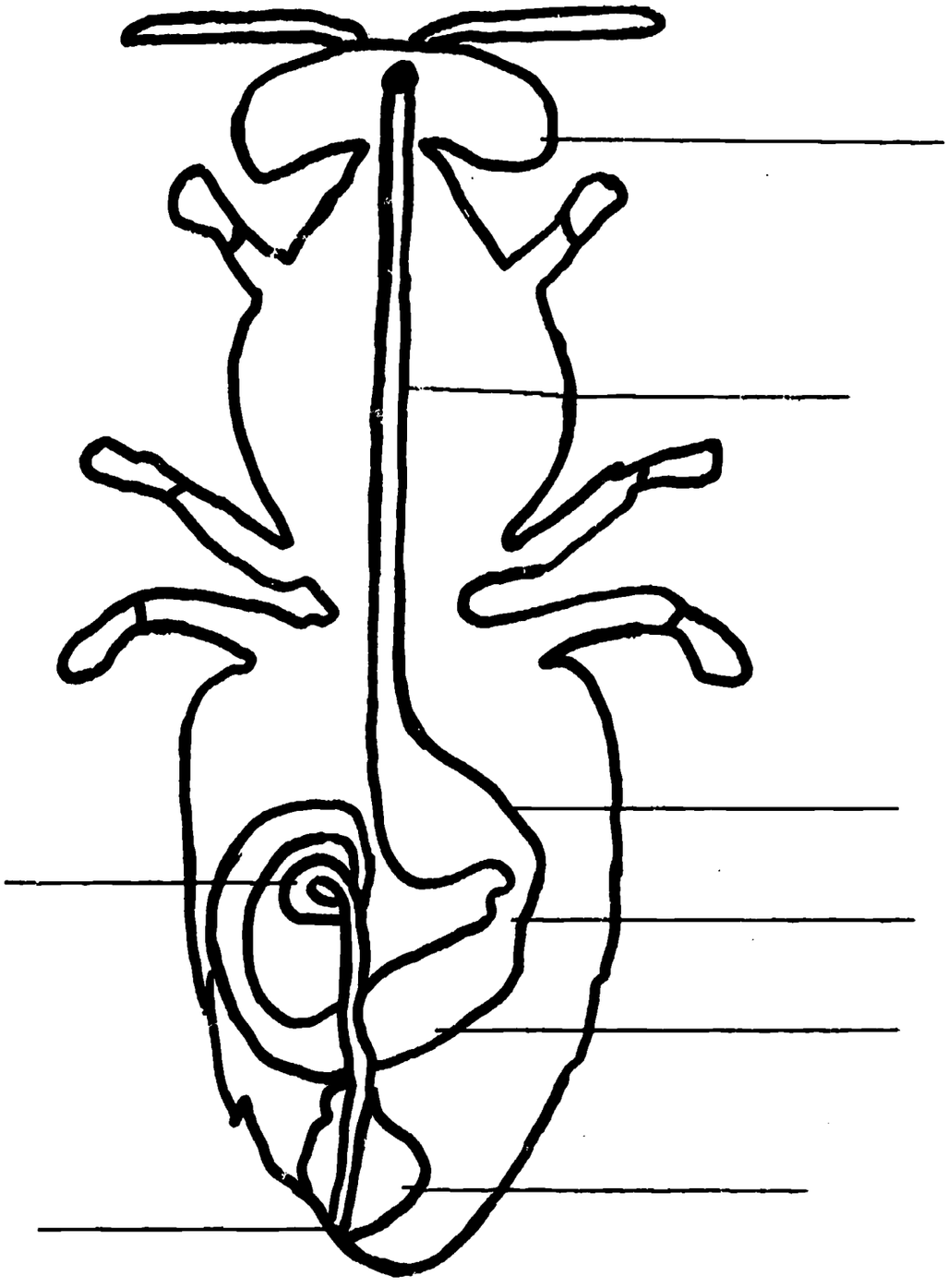
Diagram of a worker honey bee to be labeled

PROCEDURE

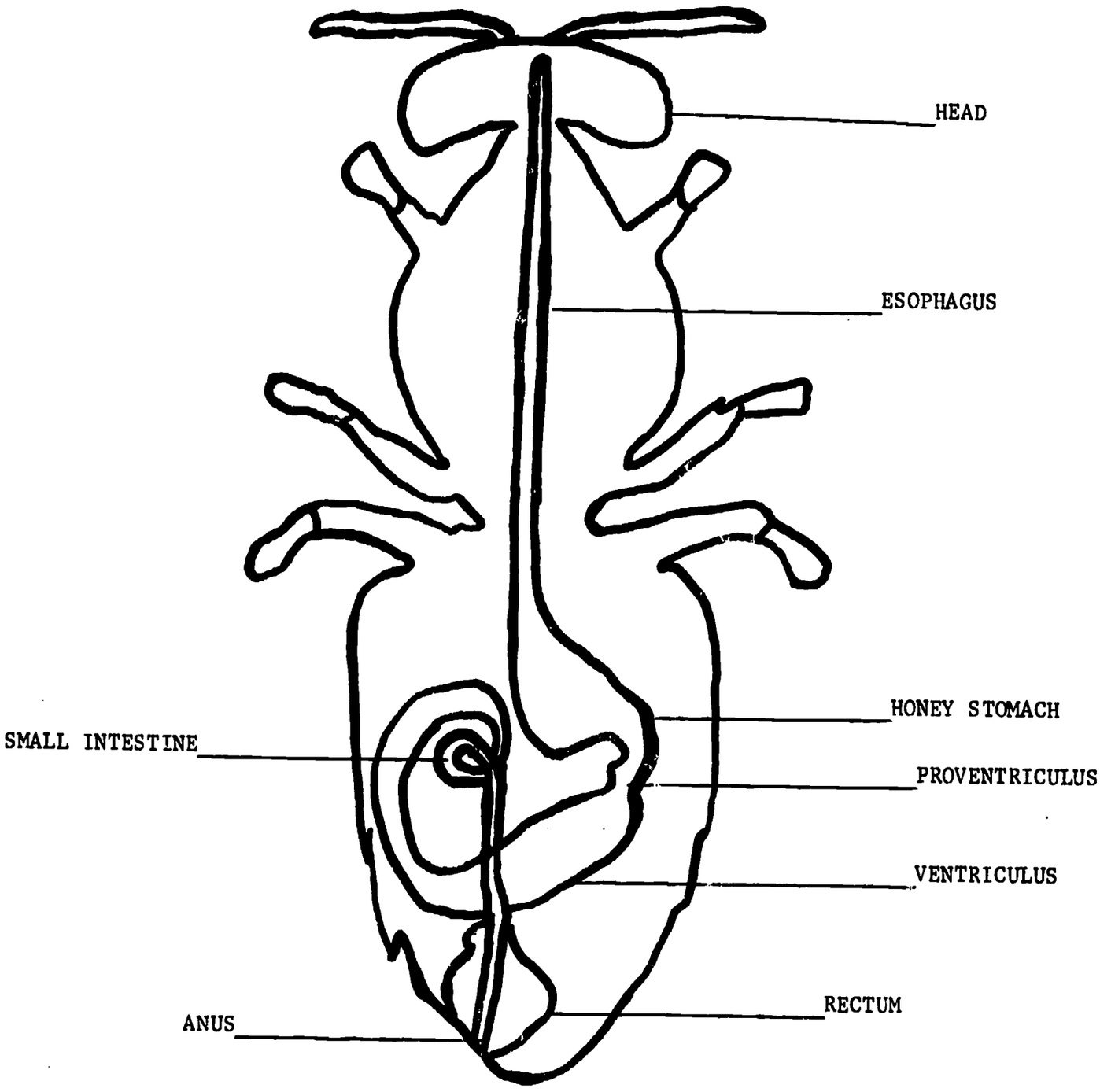
1. Use the reference materials to identify the functional parts of the worker honey bee specified by the identification lines.

2. Label the parts on the diagram

MAJOR PARTS OF THE HONEY BEE



MAJOR PARTS OF THE HONEY BEE



PROJECT SHEET I

THE HONEY BEE AND HER PRODUCTS

NAME OF PROJECT - Project 3

Feeding the honey bee a sugar solution one week after the first killing frost in the fall

MATERIAL

Hive of bees, boardman feeder, sugar solution of 2 parts sugar to 1 part water (by volume)

PROCEDURE

1. Prepare the sugar solution
2. Pour the solution into the Mason jar of the feeder
3. Place the top on the jar
4. Place the wooden feeder block on top of the jar
5. Turn the jar upside down and insert it into the entrance to beehive
6. Set the feeder so that wind or small animals will not remove it from the entrance by toenailing the feeder to the hive

PROJECT SHEET I

THE HONEY BEE AND HER PRODUCTS

NAME OF PROJECT - Project 4

Constructing an observation beehive

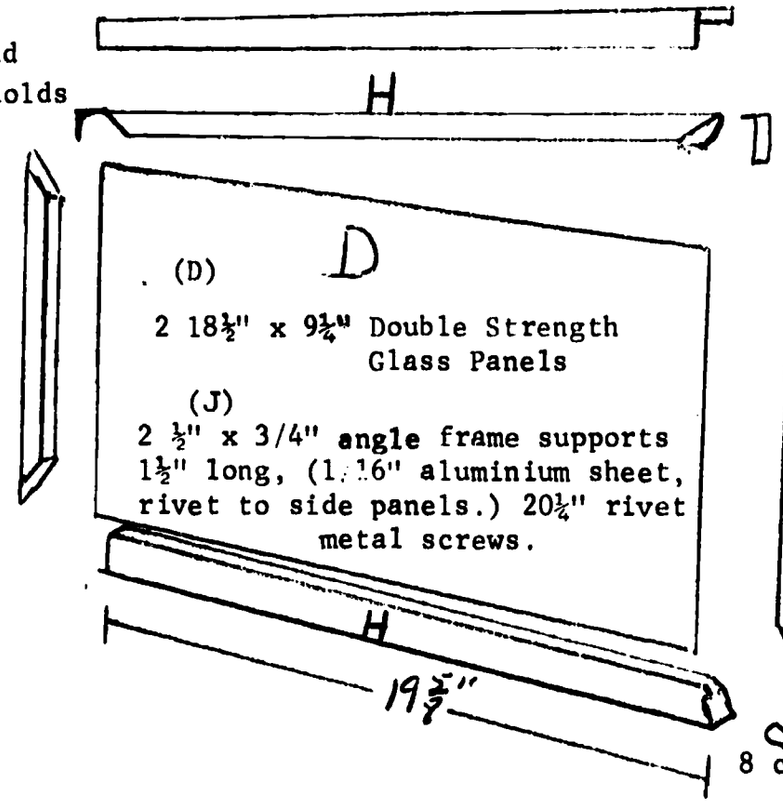
MATERIALS AND PROCEDURES

See attached list of materials and diagram

PRECAUTIONS

1. Provide a screened hole in the hive for enough ventilation.
2. Provide a bee space 3/8-inch between frames and glass sidewalls at top, bottom, and ends.
3. Prevent the hive from becoming overheated.
4. Provide an exit for bees above the head of passers-by.
5. Allow bees to fly every two or three days during warm season in situations where bees do not have an outside exit to the hive.
6. Insure the colony has a queen bee.

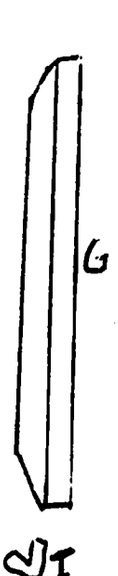
(H)
4, 19 5/8" top and bottom rails, (Reynolds Window Mold, #30 A)

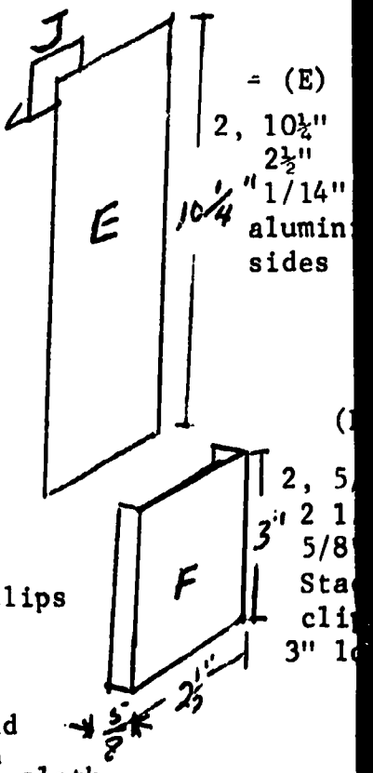


(D)
2 18½" x 9¼" Double Strength Glass Panels

(J)
2 ½" x 3/4" angle frame supports 1½" long, (1/16" aluminium sheet, rivet to side panels.) 20¼" rivet metal screws.

(G)
4 10¼" side panels (Reynolds Window mol #30A).





= (E)
2, 10¼"
2½"
"1/14"
alumin
sides

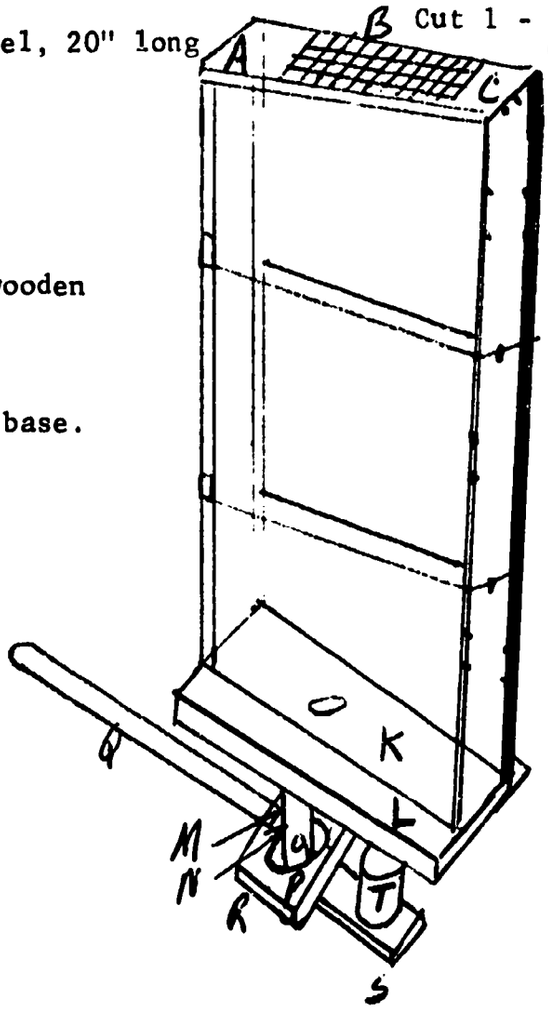
2, 5
2 1
5/8
Sta
cli
3" l

8 corner clips

(A)
1,1/8" x 2 7/16" x 1/2" channel, 20" long

(B)
Cut 1 - 8 vent, and cover with hardware cloth Secure with masking tape.

(C)



(K)
1 19 3/4" x 2 7/16" x 1 5/8" wooden frame support (cut to shape).

(L)
1 3/4" x 5 1/4" x 20" plywood base.

(M)
1 4½"flange (2 pipe).

(N)
1 1½" nipple (2 pipe).

(O)
1 tee (2 pipe).

(P)
1 5½" flange, (weld to bottom of tee).

(Q)
1 2" pipe (lenght to suit). (18 shown w/cap).

(R) 1 1 1/8" x 7" x 7" wood block.

(S) 1 1" x 6½" x 4" wood block, cut to fit.

(T) 1 Mason jar with flanged lid drilled with 8 1/32" holes.

ASSEMBLED HIVE

PROJECT SHEET I

THE HONEY BEE AND HER PRODUCTS

NAME OF PROJECT - Project 5

Observing a beehive; communications between bees.

MATERIALS

Hive of honey bees, veil, gloves, binoculars, Super 8 mm film loop, "Bees - Pollen and Nectar Dance" and a Super 8 mm projector

PROCEDURE

1. View film loop, 1-1½ minutes, "Bees - Pollen and Nectar Dance."
2. Observe a hive of bees to determine the activity occurring at the entry to the hive.
3. Wear the protective clothing of the beekeeper.
4. Locate the observation position as closely as possible to the hive without disturbing the bees' flow of traffic to and from the hive.
5. Observe the bee's activity upon departure and return to the hive.
6. Do the bees appear to communicate with each other?

PROJECT SHEET 1

THE HONEY BEE AND HER PRODUCTS

NAME OF PROJECT - Project 6

Determining how a bee gathers nectar and which foods the bee prefers

MATERIALS

A worker bee, a glass or wire cage to house the bee, food for the honey bee, flower blossoms, and sugar water; students may add more foods, a magnifying glass, Super 8 mm film loop, "Flower Pollination by Bees," and Super 8 mm projector

PROCEDURE

1. View film loop, "Flower Pollination by Bees"
2. Place the bee in the observation cage with foods
3. Observe to which food the bee is first attracted
4. Determine if bees gather more than one food at a time
5. Observe the bee to see if the bee travels from food to food
6. Observe the bee to determine the time it takes the bee to become full
7. Kill the bee then cut it open at a 90 degree angle to its standing position (Precaution - use a kill jar and a sharp instrument for cutting to avoid damaging the parts of the bee)
8. Determine if the bee has actually eaten any of the nutrients which it has gathered
   a. Examine the honey stomach
   b. Examine the ventriculus, the real stomach

What are your findings?

GLOSSARY I

THE HONEY BEE AND HER PRODUCTS

Apiary - a collection of hives or colonies of honey bees.

Anther - that part of a seed-developing plant which develops and contains pollen

Bee - (Apis mellifera) - a social insect; kept in a controlled state for the honey it produces

Beeswax - the secretion of wax by bees. This wax is a dull yellow solid plastic.

Bee escape - a device in the last super of the hive to allow the bees to leave that super but not get back inside.

Brood-the developmental stages (egg, larvae, pupae) and young bees.

Colony - a queenright of honey bees united together because they live in the same hive.

Comb honey - ripe honey which is kept intact in the honeycomb.

Chunk honey - pieces of comb honey surrounded by liquid honey.

Cross-pollination - the transfer of pollen from one plant to the stigma of another plant's flowers by wind or insect to induce fertilization

Crystallization - process of forming crystals or small solid particles in honey.

Cucurbits - a plant of the family which produces a bell-shaped fruit on a vine.

Drone - the male honey bee which develops from an unfertilized egg.

Extracted honey - liquid honey separated from uncrushed comb.

Flooding crops with bees - placing bee hives around the crop and allowing the bees to go out and pollinate the crop.

Foraging honey bee - the worker bee that goes out from the hive in search of food or nectar.

Foundation wax - Man-made sheets of beeswax upon which bees are expected to construct comb from additional bees wax.

Frame - the wooden structure inside the hive holding the foundation.

Grass - a plant with narrow, linear foliage.

Hive - a container for housing honey bees.

Honey - a sweet, thick material produced from the nectar of flowers by the honey bee.

Honeydew - a sugary secretion by various species of aphids which has been collect by bees, and has had the water content evaporated to less than 18%.

Larva - immature, wingless stage of development (wormlike) between egg and pupae stages. Develops into adult.

Legume- a plant which must have an innoculation of bacteria to fix atmospheric nitrogen in the soil.

Nosema disease - a parasite invasion of the stomach of the bee which causes partial paralysis and dysentary.

pH - hydrogen ion concentration in the soil which varies from 3.5 to 9 with 7 being neutral or equivalent to the concentration of the H ion in pure water.

Pollination - the transfer of pollen from a stamen to an ovule.

Propolis - a brown resin material collected by honey bees from buds of trees and used by the bees as a glue.

Queen - the fertile, fully developed female whose function in the bee colony is to lay eggs.

Queen cage - a small container to hold queen bees during shipment.

Queen cell - cell or division where the queen is reared; slightly larger than worker cells.

Queen excluder - a screen wire device which permits worker bees to go above brood chamber into super, but does not allow queen bees to leave the brood nest. This prevents the queen from laying eggs in the supers and ruining the honey.

Robbing - a colony of honey bees removing the honey from the hive of another colony of bees.

Royal Jelly - a glandular secretion of bees which is fed to the larvae for 3 days, and all developing queen larvae.

Secretion - a material released by an organ to perform a specialized function within the body of the bee or for other bees.

Stigma - an opening on the ovary of a female plant which receives the pollen grain where germination occurs.

Sucrose - a natural, water-soluble plant sugar.

Swarm - movement of a great number of honey bees in the company of a queen bee from one hive to form a new colony.

Ultraviolet light - light or color beyond the visibility range of the human eye at the short wavelength end of the spectrum.

Uniting - to put two colonies of bees together to form one strong colony.

Winter cluster - a method used by bees for surviving the cold weather. The bees clump together to use the heat produced by the body functions to keep warm.

Worker bee - a sexually undeveloped female bee which can lay only sterile eggs.

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QUIZ I

THE HONEY BEE AND HER PRODUCTS

Circle the best answer:

1. Propolis is_____by the honey bee from tree buds.

   a. Secreted b. Manufactured c. Gathered d. Digested

2. The primary honey bee which prevents swarming in the colony is

   a. the scout b. the worker c. the queen d. the drone

3. The queen is different from other bees in the hive in the development stages because she is

   a. fed by the worker bee
   b. deposited in a queen cell
   c. a complete female
   d. the producer of drones

True or False - Circle T for true and Circle F for false answers

T F 1. Production of honey and beeswax is the major advantage to having bees on the farm.

T F 2. Queen bees may be produced and sold commercially as an added source of income to the beekeeper.

T F 3. Only worker bees have the potential to sting.

T F 4. Bees may visit more than one plant on one trip from the hive to gather nectar for making honey.

ANSWER SHEET I

THE HONEY BEE AND HER PRODUCTS

ACTIVITY SHEET , Section II, B:

1. How does the worker bee of the colony change nectar of plants into honey or wax?

Making honey - The worker collects nectar which is 50-75% water and takes it into the hive where the bees evaporate the water by fanning it with their wings. During the evaporation of the water from the nectar, the body heat of the bees cause the enzymes to change the nectar into honey. The bees then seal the honey into cells of the comb.

Making wax - Beeswax is a liquid secreted by glands on the underside of the worker bees' abdomen. As the wax is produced, it hardens into scales. Worker bees eat about nine pounds of honey to produce one pound of wax.

2. What does "pollination" mean? Pollination is:

   a. The act of uniting pollen from the anther with the stigma or an ovule of a plant to produce fruit or seed on the plant
   b. The act of fertilizing plants so that fruit or seed may be produced by plants.

3. What is the role of the honey bee in pollination of plants?

Pollination is best accomplished by honey bees because the bees visit each plant several times. Bees also collect pollen from a variety of plants. The more often bees visit a plant, the greater the number of seeds or fruit that is produced. The honey bee's role in pollinating plants is to maintain about 50 agricultural crops in this country. The honey bee is the only insect which man can develop, handle, and move to advantage in pollination of crops.

4. What effect does the number of times a bee visits a plant blossom have on the fruit yield of the plant?

The more times a bee visits a blossom, the greater the fruit or seed yield will be.

5. If you were entering the beekeeping business and intended to buy bees, what race of honey bee would you purchase? Why?

Italian because they are calm, industrious, and do not sting as often as do other bees. OR Caucasian because they are gentle, thrifty with wint stores and will work at cooler temperatures than other races.

QUIZ I

Multiple Choice

1. e
2. c
3. c
4. b

True/False

1. F
2. T
3. F
4. T

ACTIVITY SHEET II

COLONY ORGANIZATION

OBJECTIVES

After studying this lesson, the student will be able to:

1. Describe the honeybee colony and its size

2. Describe the characteristics and responsibilities of the queen, worker, and drone honeybees

3. Define and describe swarming

PROCEDURES

I. Study Information Sheet II. If the student has difficulty with this lesson, he should read the references before asking his teacher for help.

II. When the student believes he understands the material in the information sheet, he should answer the following questions. These questions are to help the student to understand this lesson. Complete answers should be given to each question.

A. What is a bee colony?

B. What is the role of the queen bee in the hive? What are her distinguishing characteristics?

C. What does the worker do in the hive?

Describe the worker bee.

D. What is the job of the drone in the colony? What are his distinguishing traits?

E. What effect does the size of the colony have upon its success?

F. What is "swarming" and how may the beekeeper control swarming in the apiary?

INFORMATION SHEET II

COLONY ORGANIZATION

A. Colony Organization and Size

The honey bee colony is like a very small city in itself. The colony is made up of thousands of bees with each bee doing work which, rather than being assigned, is determined by the bee's age and experience. When you look into a bee colony you see streets or passageways called bee spaces, which are always neat and clean. A normal healthy colony contains three types of bees with each bee depending on the others for its survival. A normal colony contains:

1. One (1) queen bee

2. Forth-thousand - fifty-thousand (40,000-50,000) worker bees

3. One-hundred - two-hundred (100-200) drone bees

Also contained in the bee colony, will be eggs, brood or developing bees, and food. Every bee in the colony must do its job in order for the colony to be successful and productive. A bee unable to do his job is thrown out.

Inside the hive, air moves freely. The temperature of the hive remains about 93 to 95 degrees F. in the brood nest. Bees seem to realize that organization is the key to success.

The colony is the bee family. The beehive is the home of the bees.

1. Egg - Larvae and Pupae

As with all forms of life, the honey bee goes through certain stages of development. These stages include the egg, larva, pupa, and adult stages. At the adult stage of life the honey bee may be either a worker, queen, or drone bee.

The queen lays the eggs. These eggs are white, elongated, very small and attached to the base of a cell. After three days in the cell, the larvae hatches from the egg. Worker eggs are laid in the worker cells. Eggs which develop into queen bees are laid in special queen cells used only one time. Drone eggs are laid in drone cells.

After three days the egg hatches into the larva, which looks very much like a small white grub worm. The larvae are fed on royal jelly (milky, white jelly) by nurse bees for the first three days. For the next three days the worker larvae, larvae that will become worker bees, are fed a less nutritional substance and progressively less. The larva grows very rapidly during its first week of life and doubles or triples in size. On the ninth day the larvae are capped (sealed) in the worker cells with wax. No more feeding occurs after the cell is capped.

During this time the pupal stage begins and lasts for 12 days. The pupae goes through a series of molts, to change the outer covering. After the last molt and about 2 or 3 days after the cell is capped, the bee begins to develop its adult parts such as wings, legs, eyes, and other parts. The pupa continues to develop and grow. On the 21st day of development, the adult worker bee crawls out of the cell.

The queen bee goes through the same processes; however, it only takes her 16 days to develop. This is due to the feed which she is given. The queen is fed royal jelly which is secreted by special glands in the head of the nurse bees (worker bees). This high quality food causes the queen bee to develop earlier, and causes her female reproductive organs to develop completely.

The drone bee takes 24 days to develop from egg to adult.

When the bee is going through these stages (egg, larva, pupa) of development it is living in the brood nest. The brood nest is usually located in the first story of the hive. The eggs, larvae, and pupae are referred to as brood. The brood chamber is the entire area where the brood develops including the brood nest itself along with the additinal comb, honey and pollen necessary to feed the undeveloped bees.

LIFE OF THE HONEY BEE

Developmental State IN DAYS	Queen	Worker	Drone
Egg Stage	3	3	3
Open Larval Stage	6	6	6-½
Sealed Pupal Stage	7	12	14-½
Total Development Period	16	21	24

2. The queen bee

Role in the bee colony

a. Female bee whose main job is to lay eggs, but whose secondary function is to maintain colony organization by producing behavioral hormones.

b. She begins to lay eggs in early spring, when the bees begin to bring in pollen. She continues to lay eggs until the temperature and food conditions in the fall are poor due to the cool weather.

c. A queen lays 1000-1500 eggs per day at times, depending on her food intake.

Characteristics of the queen bee

a. Long abdomen and short wings.

b. Thorax is slightly larger than that of the worker.

c. She doesn't have pollen baskets nor functional wax glands.

d. Queen bee has a stinger but rarely uses it (may use stinger on other queen bees).

e. May live 5-6 years, however, 2 years in the hive is recommended for best results.

f. Old queens sometimes produce excess drones or fail to lay eggs in the spring. Springtime is when the queen should lay many eggs.

g. The queen bees are reared in a rather large cell which looks like a peanut shell pointed down. The queen cell has an inside diameter of 1-1/3" and hangs down 1" or more.

h. The queens are fed as infants on royal jelly, wholesome food of glandular origin, supplied by nurse bees (worker bees between the ages of 5 and 15 days old).

i. The mating of the queen bee occurs once in a lifetime. It happens while she is flying, usually 8-12 days after coming out of the cell (birth) as an adult. This mating flight of the queen is influenced by the weather. A sperm sac in the queen's body stores the sperm received from the drones during mating until it is needed to fertilize worker eggs. When this sperm supply begins to run out, the queen will lay more drone eggs usually in the worker cells. When this occurs, the worker bees will begin to produce a new queen to take over for the older one. This would be the only time that two queen bees live in the hive peacefully, that being a mother queen and her daughter.

j. The egg which the queen develops from is the same as the worker, however, due to special food, she develops in 16 days and has the reproductive organs characteristic of the queen.

k. The queen will begin to lay eggs 10-14 days after emergence.

l. Queens should be replaced at least every two years.

m. A colony is no better than its queen!!!

3. The Worker Bee

Role in the bee colony

a. Worker bees do all the work or labor in the hive. They do this very orderly according to age:

1. Young workers are house bees during the first 2-3 weeks of adulthood.

2. House bees care for the queen and brood.

3. Changing nectar to honey.

4. Secreting wax.

5. Building comb.

6. Cleaning and ventilating the hive.

7. Guarding the entrance to the hive.

8. Going into the field and gathering water, pollen, nectar and propolis.

b. The worker does all the work in both the hive and field except for egg laying

Characteristics of the worker bee

a. Female bee but lacks fully developed reproductive organs

b. Twenty-one days are required for worker bees to develop from egg to adult.

c. Workers are produced from fertilized eggs laid in worker cells by the queen.

d. Life span of less than eight weeks during the summer.

e. Larvae of the worker are fed on pollen mixed with nectar or honey, after three days of royal jelly-feeding.

f. The worker is the most abundant bee in the hive. 40,000-50,000 worker bees in the hive during the active season. The number of worker bees in the hive has been known to go as high as 75,000 during a very active season.

g. Physical characteristics of the worker bee include:

1. A longer more triangular head than the queen.

2. Well-developed compound eyes.

3. Three simple eyes on the top of the head.

4. Smooth rounded mandibles, especially designed for molding wax and cleaning the cells.

5. Four sets of wax glands on the underside of the abdomen.

6. Honey stomach, enlargement of the oesphagus.

7. Well developed sting and venem sac, used for defense.

4. The Drone

Role of the drone in the bee colony

a. Hatched from infertile eggs in cells that are larger than regular comb cells. The cappings of drone cells are higher than regular comb cells.

b. Only purpose of the drone is to mate and fertilize a virgin queen. The drone is the only male member of the colony.

Characteristics of the drone

1. Larger and more robust than the worker.

2. Shorter than the queen.

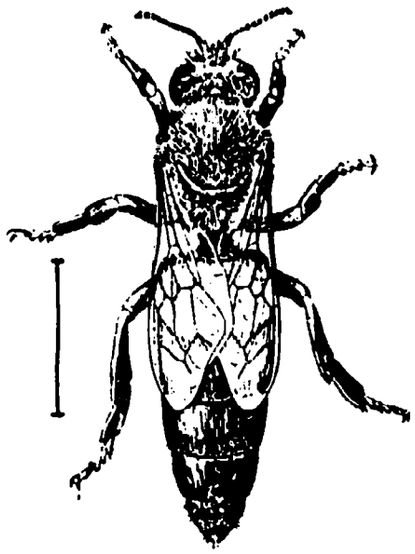
3. Heavier and longer than the worker.

4. Compound eyes meet on top of their head.

5. Antennae are larger and have 13 segments.

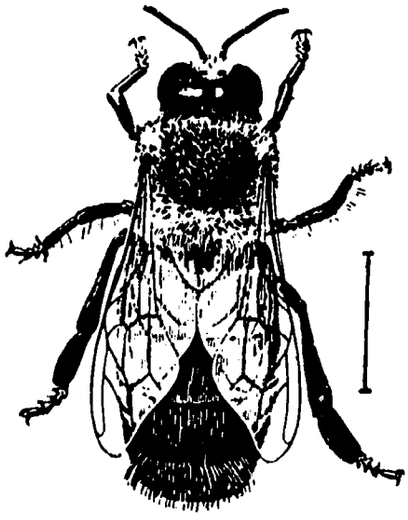
6. Smaller mouth and tongue than worker.

7. Mandible chisel-like and notched.



Queen

Worker



Drone

8. No pollen baskets on legs.

9. No stinger.

10. Cannot sting and do not work but increase colony morale (spirit).

11. Stay in hive during swarming.

12. The drone is usually driven from the hive after the swarming season. The workers drive the drone away in order to conserve food.

B. Swarming

Swarming is the natural method for honey bees to establish new colonies. Swarming is a natural means for bees to increase their numbers. The successful beekeeper tries to avoid swarming because it interferes with honey production. Swarming occurs when a great number of honey bees leave the hive together with a queen to start a new colony elsewhere. Usually half of the bees, normally the older bees, leave the colony together with an older queen. Swarming is brought on by:

1. Failure of the queen to lay eggs.

2. Poor ventilation.

3. High temperatures in the hive.

4. Overcrowding in the brood nest.

Swarming usually occurs just before or during the early part of a nectar flow. Swarming may also occur when the nectar flow is heavy but broken by alternate periods of rainy and fair weather.

A good indication that a colony of bees is ready to swarm is a large cluster of bees on the outside of the hive. However, this could mean that the hive is full and the bees have no place to store their nectar, or that the bees have nothing to do because the nectar flow, a time when nectar is plentiful and bees produce and store surplus honey, is over. However, anytime that bees cluster on the outside of the hive, the colony should be checked for the presence of queen cells containing eggs or larvae. If eggs or larvae in the queen cells are found this indicates that the bees are planning to swarm.

A number of precautions can be taken in order to prevent or to discourage the colony from swarming.

1. During the summer months, especially, keep the area around the hives free of weeds and other objects that prevent good air circulation.

2. Provide shade in the hot summer months.

3. Enlarge the hive entrance during the summer.

4. If more ventilation is needed, enlarge the entrance, or crack

the hive between the brood chamber to allow more air circulation.

5. Examine the colony. If more space is needed and the colony has enough brood chambers, then add another super.

Prevent swarming by clipping the wings of the queen bee, and every 7 days cut out the queen cells that have formed.

Swarming fever is a state of heightened or intense activity or emotion. This intense activity can be seen easily just prior to swarming. A number of precautions can be taken to prevent swarming fever.

1. Provide plenty of storage room for surplus honey.

2. Provide the queen with ample egg-laying space.

3. Eliminate all large areas of drone comb.

4. Provide the colony with a young, vigorous queen. Supersedure queens are usually of good quality. Supersedure is a process by which a failing or otherwise defective queen is replaced; and does not cause the colony to swarm, that is, to divide. Supersedure cells do not look like swarm cells, and should not be destroyed.

5. Provide adequate watering places.

6. Remove combs of brood and replace with empty combs to relieve congestion.

7. Make divisions.

Finally, a number of precautions can be taken if the swarming fever has not been prevented, thus preventing a certain amount of swarming:

1. Check for and remove queen cells every 8-10 days.

2. Before destroying all the queen cells, check to make sure the cells you are destroying are not supersedure cells. (An attempt by the colony to replace a failing queen. A natural replacement of an established queen by a daughter). Swarm cells, queen cells which will lead the swarm, are usually numerous, of different ages, and are built along the lower edge of the comb. Supersedure cells are usually of the same age, few in number, and located on the surface of the comb. Few, if any eggs will be in the comb if the cells are supersedure cells.

3. If the cells are supersedure cells, (developing daughter cells) leave one to emerge and then destroy the old queen.

4. Remove four or five frames of comb containing honey or sealed brood from the colony and replace then with empty foundation combs. (These frames may be used for making new colonies or put into a super in a weak colony).

5. Exchange weak colonies with strong colonies to prevent swarming. This should be done at about the time of Maple bloom (April 15-

May 10). Weak colonies will be strengthened by this and strong colonies will lose some of their strength and desire to swarm.

6. Forced supersedure may help swarm control. Remove old queen and after four days remove all but one of the queen cells. This cell should be allowed to develop and to head the colony. Check again, and destroy all new queen cells in three to four days.

If these procedures for preventing swarming and swarming fever fail and the colony swarms, the following procedure should be taken:

1. In order to find the colony which has swarmed, look for the colony which has opened queen cells along with a few sealed queen cells. This indicates the colony which has swarmed. Also, the colony will be about half strength as far as the number of bees is concerned.

2. The swarm should be retrieved. Usually, the bees will cluster into a ball-shape. Bees have been known to stay in a cluster for several days in order to establish a new hive in that spot. (No doubt, when most swarms leave the hives they are lost and not gotten back). If the swarm clusters on a low limb, the limb may be removed and placed at the entrance to the hive from which the bees swarmed. Usually, the bees will walk into the old hive on their own.

3. Another way of handling a colony which has lost bees due to swarming is to:

   a. Move the old hive or hive from which the bees swarmed off to the side a few feet and kill or remove the queen.

   b. Place a new hive with a new queen on the stand of the old hive.

   c. When the new queen emerges in the new hive and begins to lay eggs, the old colony will unite with the new colony.

   d. After all the bees are out of the old hive and into the new hive (1-2 weeks), remove the old hive to new location and reuse it.

   e. If there is an old queen in the old colony, it should be killed before the colonies are united.

PROJECT SHEET II

COLONY ORGANIZATION

NAME OF PROJECT - Project I

Visiting a local beekeeper

MATERIALS

Arrange with the beekeeper a time which suits him when the student may visit. Camera, paper and pen, and tape recorder can be taken.

PROCEDURE

1. Discuss the apiary operation with the beekeeper.
2. Ask the beekeeper how he prevents or reduces swarming.
3. Take pictures of the apiary and beekeeper.
4. Present your findings at a FFA meeting.
5. Write a news article about your visit to be printed in the school newspaper.

PROJECT SHEET II

COLONY ORGANIZATION

NAME OF PROJECT - Project II

Identifying the parts of a honeybee.

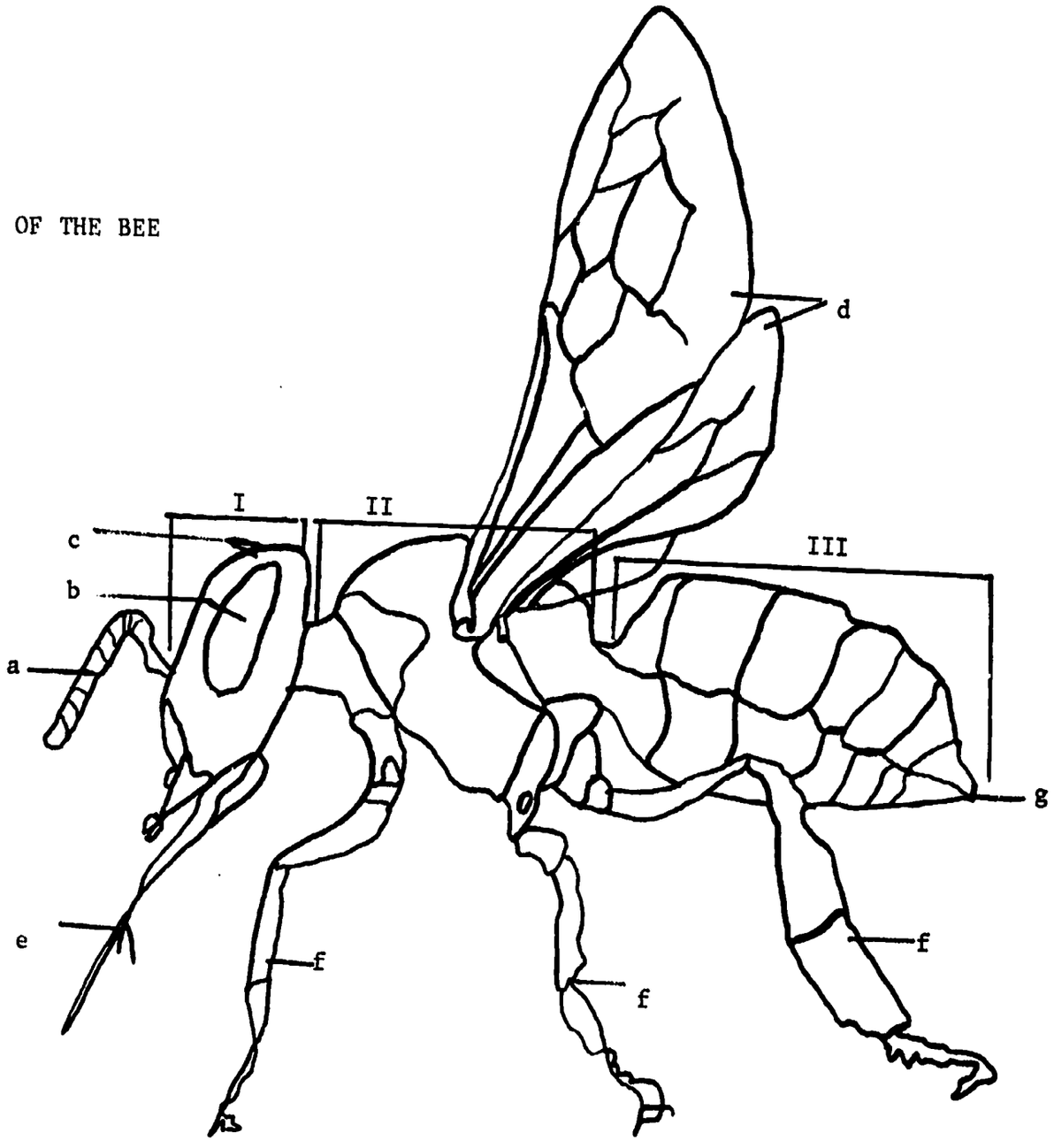
MATERIALS

Drawing of the honeybee, and a pencil.

PROCEDURES

1. Use reference materials for Lesson II.
2. Idnetify the parts of the bee.

PARTS OF THE BEE



I.

II.

III.

a.

b.

c.

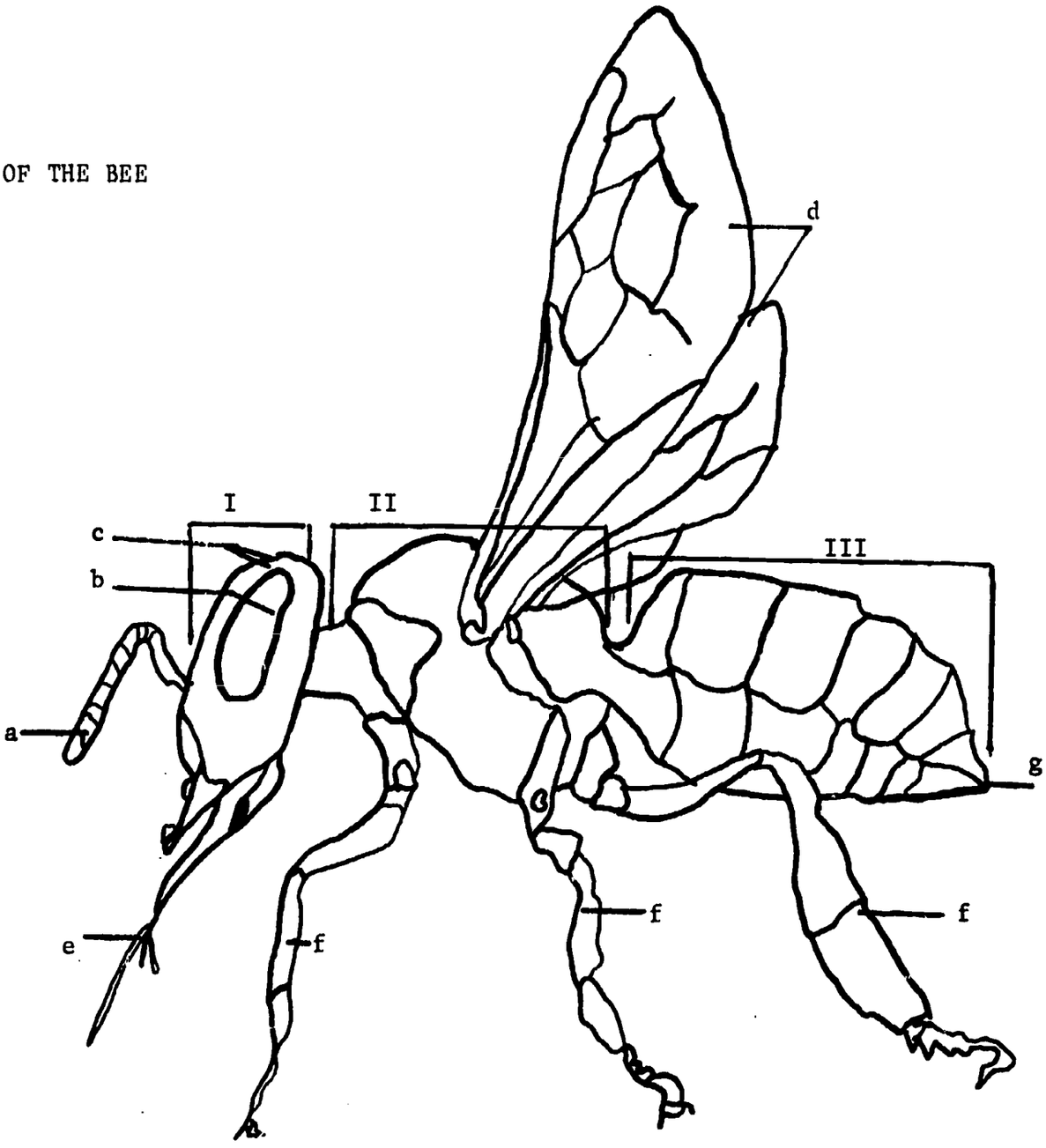
d.

e.

f.

g.

PARTS OF THE BEE



I. Head - Upper division of the body of the insect that contains the brain.

II. Thorax - Middle of the three chief divisions of the body of an insect. Heart and respiratory system located in the thorax.

III. Abdomen - Rear section of the body behind the thorax in an insect.

a. antenna

b. compound eye

c. simple eyes

d. wings

e. mouth

f. legs

g. stinger

GLOSSARY II

COLONY ORGANIZATION

Abdomen - rear section of the body of the honey bee located behind the thorax

Brood nest - young, undeveloped bees in the brood chamber

Cell - small compartment in the honeycomb

Cluster - group of bees gathered together usually at swarming, and resembling a ball

Colony - the bee family

Drone - a male honey bee that mates and fertilizes the virgin queen bee

Foundation - a sheet of beeswax or artificial material which has bases of cells pressed into it. It is placed there so the combs made on it can be easily worked with

Head - the division of the body of the honey bee than contains the brain, sense organs, and the mouth.

Hive - home of the bees

Honey flow - (or nectar flow) - the time of year when nectar is plentiful and bees collect it to produce honey

Nurse bees - workers 5 to 15 days old who feed the larvae

Queen bee - female honey bee

Royal jelly - food secreted by nurse bees

Supersedure - a natural replacement of an established queen by a daughter

Swarming - process of reproduction where a portion of honey bees leave the hive with a queen bee to start a new colony elsewhere

Thorax - the middle part of a honey bee in which the heart and respiratory systems are located and to which the legs are attached.

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Clarke, W. W. Jr., Pennsylvania Beekeeping, Circular 544, University Park, Pa. 16802: Pennsylvania State University, College of Agriculture Extension Service, 1971.

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Gillespie, William H. and Dick, Oscar M. Jr., Beekeeping in West Virginia, Bulletin 33, Charleston, W. Va. 25305: West Virginia Department of Agriculture, 1966.

QUIZ I

COLONY ORGANIZATION

Multiple choice - circle the best answer.

1. The queen bee's most important job is to:

   a. gather nectar to make honey

   b. keep the hive clean

   c. lay eggs

   d. care for the brood

2. In a healthy hive you would find how many worker bees

   a. 40,000-50,000 - peaking at 75,000 during active season

   b. 25,000-75,000 - peaking at 100,000 during active season

   c. 1 - 100 - peaking at 500 during season

   d. only one (1) worker bee in the colony

3. The main duty of the drone is to

   a. lay eggs

   b. mate and fertilize the virgin queen

   c. gather nectar

   d. pollinate flowers

4. A good definition of swarming would be:

   a. means of gathering food

   b. battle between drones and queens

   c. new type of bee hive

   d. natural method of reproduction used by bees

QUIZ (continued)

True - False - circle T if the statement is True, and F if the statement is false

T F 1. Royal jelly is fed to the queen larvae.

T F 2. The beehive stays at a relatively constant temperature.

T F 3. The queen bee should be replaced at least every two years.

T F 4. The worker bee has a life span of 2-2½ years.

ANSWER SHEET II

COLONY ORGANIZATION

ACTIVITY SHEET II, SECTION II:

1/ What is a bee colony? The bee colony is the family of bees, living in a hive. The bee colony contains

1 queen
100 - 200 drones
40,000 - 50,000 workers

The bee colony is very well organized with each bee doing a specific job.

2/ What is the role of the queen bee in the hive and what are some distinguishing characteristics:

The role of the queen bee is to lay eggs. She lays 1000 - 1500 eggs per day depending on her food intake.

Distinguishing characterisitic include:

1. Long abdomen and short wings
2. Thorax is slightly larger than that of the worker
3. Does not have pollen baskets or functional was glands
4. Develops in 16 days from same egg as worker

3/ What does the worker do in the hive and what does the worker look like?

The job of the worker is to do all the labor or work in the hive. This includes nursing the queen, caring for brood, changing nectar to honey, secreting wax, building comb, cleaning and ventilating the hive, guarding the entrance to the hive, going into the field and gathering water, pollen, nectar and propolis.

Characteristics include:

1. Longer, more triangular head than a queen
2. Well developed compound eyes
3. Three simple eyes in the vertex
4. Smooth, rounded mandibles, especially designed for molding wax and cleaning the cells
5. Four sets of wax glands on the underside of the abdomen
6. Honey stomach, enlargment of oesophages

4/ What is the function of the drone and what are some distinguishing characteristics?

The purpose of the drone is to mate and fertilize the queen.

Characteristics of the drone include

1. Larger and more robust than the worker
2. Shorter than the queen
3. Heavier and longer than workers, but shorter than a queen
4. Compound eyes meet on top of their head
5. Antennae are larger and have 13 segments
6. Smaller tongue and mouth
7. Mandible chisel-like and notched
8. No pollen baskets in legs
9. No stinger

5/ What effect does colony size have on the success of the bee project?

In order to have a successful colony you need

1 queen
100-200 drones
40,000-50,000 workers

6/ What is swarming and how can the bee keeper keep the hive from swarming?

Swarming is the natural method of reproduction used by bees. Honey bees leave the hive together with a queen and form a new colony.

Precautions from swarming include

1. Keeping hives free of weeds and allowing good air circulation
2. Provide shade
3. Enlarge hive entrance during the summer
4. Provide plenty of storage for surplus honey
5. Provide queen with ample egg laying space
6. Provide adequate watering places

ANSWER SHEET

QUIZ II

1.) The queen bee's most important job is to:

c. lay eggs 1000-1500 during spring

2.) In a healthy hive you would find how many worker bees:

a. 40,000-50,000 peaking at 75,000 during active season

3.) The main duty of the drone is to:

b. to mate and fertilize the queen

4.) A good definition of swarming would be:

d. natural method of reproduction used by bees

1. True

2. True

3. True

4. False, workers in the active honey season usually live about eight weeks.

ACTIVITY SHEET III

HOUSING AND EQUIPMENT

OBJECTIVES

After studying the individual lesson, the student will be able to:

1. Describe and list the main parts of a modern beehive including the bottom board, hive body, extracting supers, inner cover, outer cover, queen excluder, frames, and sections.

2. Describe and explain the use of the smoker.

3. Describe a veil and its use.

4. Describe the proper clothing to wear when working with bees.

5. Explain the role of the honey house in the Apiary Business.

6. Describe a hive tool, honey extractor, and wax extractor and explain their uses

PROCEDURES

I. Study Information Sheet III. If the student has difficulty, he should read the references for Lesson III before asking the teacher for help.

II. When the student understands the information presented in this lesson, he should answer the following questions. These questions are designed to help him to understand this unit. The student should give a complete answer to each question.

III. Answer the following questions:

1. List and define the seven main parts of a beehive.

2. What is a honey house?

3. What is a bee smoker?

4. What is a beekeeper's veil?

5. What type of clothing should a person wear when working with bees?

6. What is a hive tool and how is it used?

7. Of what use would a honey extractor be to the beekeeper? What types are available?

8. What is a wax estractor? What does it look like?

INFORMATION SHEET III

HOUSING AND EQUIPMENT

A. Hive

1. The hive is the home of the bee.

2. An apiary is the place where bees are kept.

3. L. L. Langstroth developed the movable frame hive which is used by practically all beekeepers. His principal contribution was his discovery of "bee space."

Parts of the beehive

These parts sit on top of each other and should not be fastened together. The bees will glue the parts together with a substance called propolis.

1. Bottom board - The bottom board is the exact width of the hive, but about 3" longer so it can serve as the landing place. It has rails around 3 sides to support the other parts which rest on it. These rails are 7/8" high with the reverse side about 3/8". An entrance cleat is used in the fall to restrict the entrance to keep out mice if the deep side (7/8") is used. The bottom board should be off the ground just enough to keep it dry. The bottom boards may be placed on bricks, especially designed stands, or concrete blocks. Each hive (bottom board being the first part) should rest on individual stands to allow for ease of handling and less jarring of one hive when working on the other. If cinder blocks are used, they should be placed with the hole lying horizontally to discourage termite attack on the bottom board.

2. Hive body - A hive body is called the brood chamber, a full-depth super, and/or a food chamber. The hive body is where young bees are raised. Besides serving as a nursery, it is the living quarters for bees and their workshop. The hive body contains movable frames hanging from the top. Frames which are 19" long x 9-1/8", are deep spaced 1-3/8" from center to center. Most beekeepers prefer to use nine frames in a 10 frame hive body, making them easier to manipulate. This is done in extracting supers as well, making frames of honey easier to uncap before extracting honey.

3. Frames - Frames are used in the brood nest (hive body) and supers to hold the comb in which brood (developing eggs, larvae, pupae) are reared and in which honey is stored. Supers are divisions of hive in which bees store honey. Frames vary in size according to the super in which they are placed. The Hoffman frame is most widely used. Each frame should contain a full sheet of foundation material on which bees can construct comb and store honey.

4. Extracting supers - Extracting supers are used as food chambers and for the storage of surplus honey. There are four standard sizes of supers used. These supers are placed on top of the hive body. If the hive body is used as a super, there are five types of supers, as follows:

(1) Standard shallow super - super holding the 5-3/8" depth frame (holds 30-40 lbs. of honey).

(2) Hive body used as super - this is not recommended due to its weight of 75 lbs. (50-60 lbs. of which is honey).

(3) Super which holds the 6-¼" depth frame (35-45 lbs. of honey).

(4) Super which holds the 4-½" deep frame.

(5) Section super or comb honey super used in the production of comb honey.

5. Queen excluder - The queen excluder is a device used to confine the queen to a certain part of the hive. Usually the queen is just confined to the hive body, so no eggs will be laid in the honey supers above the hive body. The queen excluder is made of perforated zinc or wire grid bound with wood or metal. The openings in the queen excluder are large enough to allow workers to pass through but not the queen or drones.

6. Inner cover - The inner cover helps to insulate the hive and adds convenience in handling bees by making it easier to remove the outer cover. The inner cover also acts as an escape board for removing honey. It should be designed to provide for the escape of water vapor from the hive.

7. Outer cover - The outer cover extends down over the sides of the hive (telescopes) to cover the top most super. It acts to protect the hive from the weather. The covers are made to sit snug over the top of the individual hive. Usually, they are covered with galvanized metal or aluminium. Wooden covers are still used by some commercial beekeepers who move their bees.

ADDITIONAL HIVE INFORMATION

1. A 9-10 frame hive is usually used. (Std. frame size 18-1/8" x 9-1/8" x 1-1/8").

2. Movable frames must be used due to State Inspection Laws and the necessity to have attractively packaged honey for sale due to public demands. Homemade beehives are generally NOT recommended unless they are made by an especially good carpenter in accordance with standard specifications.

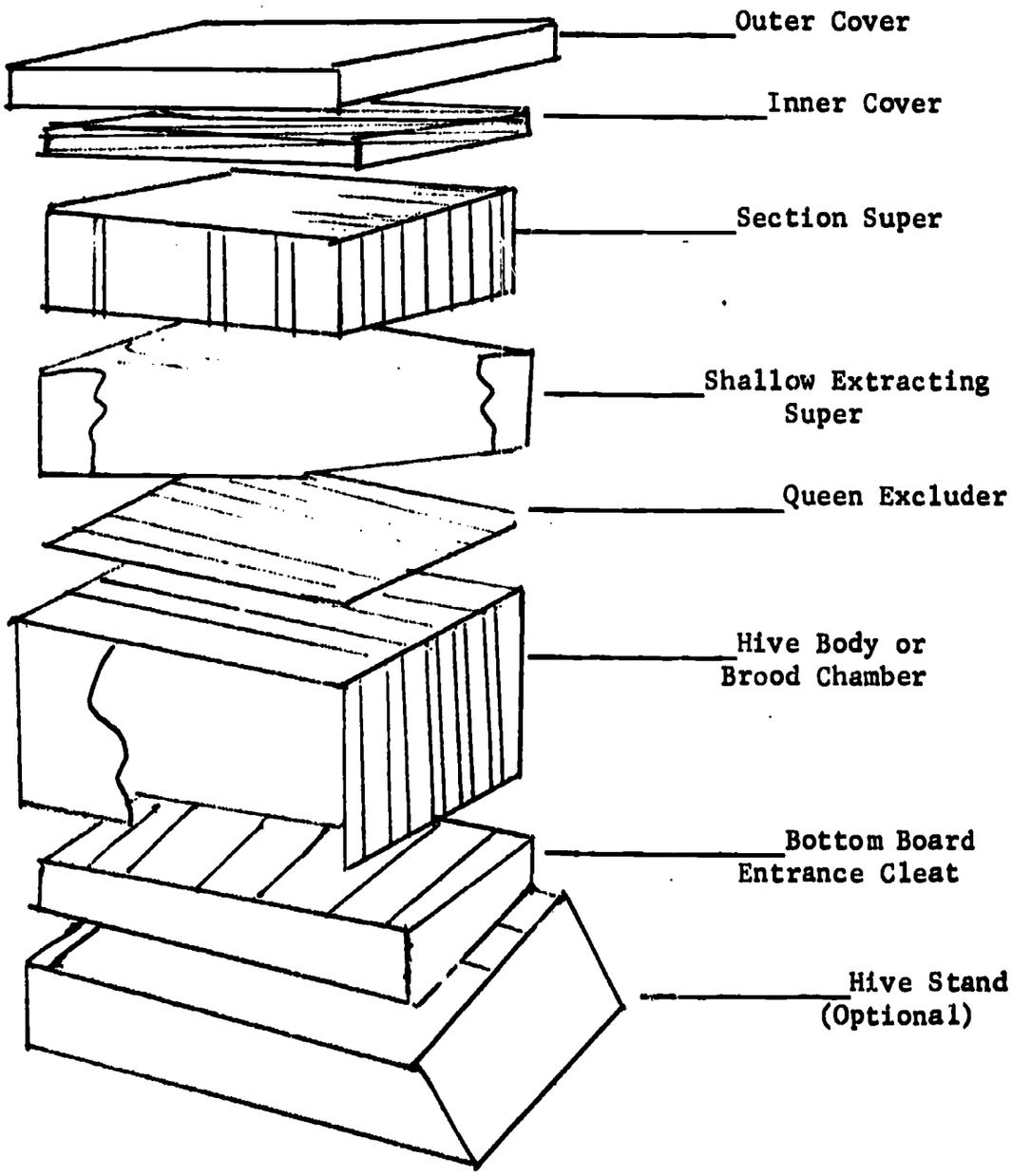
3. Paint the hive either white or aluminum to reflect sunlight which keeps the temperature desired and also presents a pleasing appearance. (Usually, hives are bought unpainted and unassembled). Paint should not be applied to inside surfaces.

4. Most of Virginia's beekeepers use one hive body and one shallow super or two hive bodies for rearing bees, with supers on top of them for honey storage.

5. VERY IMPORTANT - A 3/8" space is left between combs. A greater space will be filled with additional comb, a smaller space with propolis.

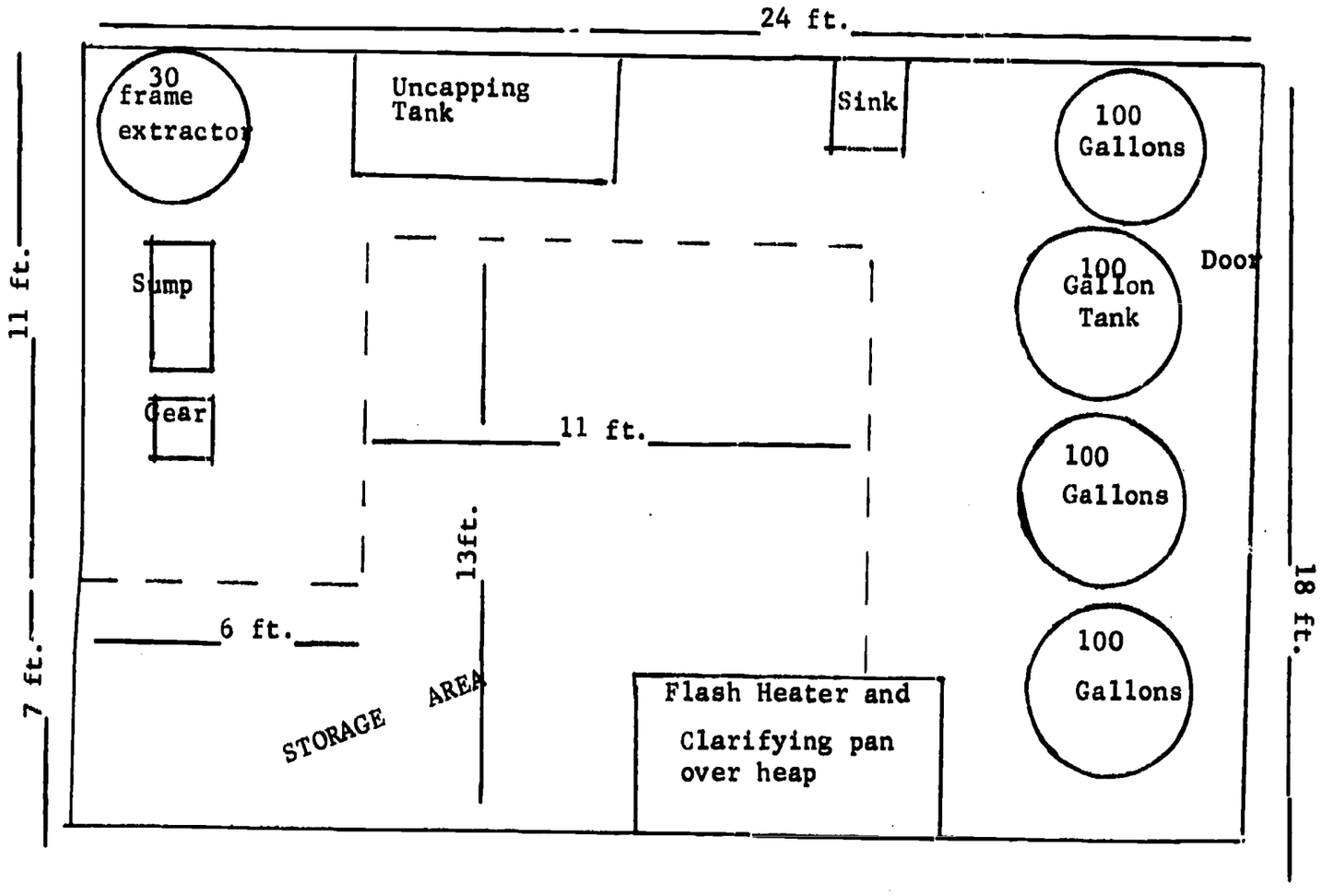
6. Hives are located no more than 4 feet off the ground.

PARTS OF A MODERN BEEHIVE



B. Honey House - The honey house is simply a building used for the storage of equipment and for extracting honey. The honey extractor and the wax extractor are located in the honey house. Honey may be stored in the honey house. It is wise to have the honey house separated from the apiary in order not to attract the bees while working with the honey. Always allow plenty of room for growth and expansion when planning to build a honey house.

HONEY HOUSE FLOOR PLAN*



Drawing taken from Bee Supply Super Market, 1971 Catalog.

* Drawing not to scale.

C. Equipment

1. Smoker - A device that puffs smoke over the hive; simply a fire pot with bellows attached.

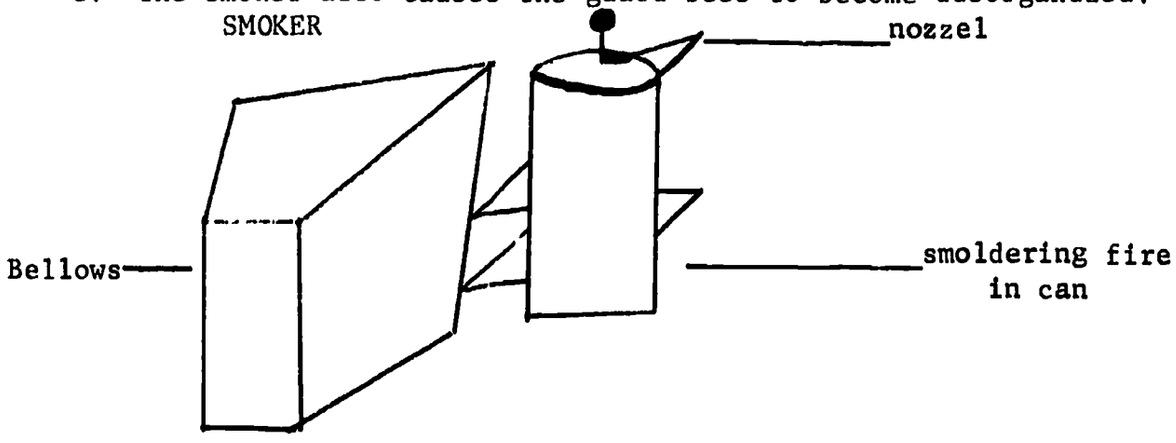
   a. Very useful tool when working directly with the bees.

   b. Smoke causes bee to fill up with honey. (Bees eat the honey in the hive in order to protect the food supply).

   c. When the bees are full of honey, they have less desire to sting.

   d. Smoker fuels include rotten wood excelsior, burlap, and cotton waste. (Plant material such as green grass is often placed on top of the fire to produce more smoke, and to prevent expulsion of fire and sparks).

   e. The smoker also causes the guard bees to become disorganized.



2. Procedure for using the smoker:

   a. Have smoker well-lighted and smoldering before opening the hive.

   b. Light smoker with paper in bottom, then add fuel and puff bellows slowly. If bellows are puffed excessively, fire will puff out of the end of the smoker.

   c. When properly attired, approach the hive from the side away from the bee's line of flight. Blow a puff or two of smoke across the hive entrance to disorganize the guards. Apply at adjacent hives also.

   d. Pry up the inner cover and blow several puffs of smoke under it.

   e. Remove outer cover entirely, wait a few seconds, then remove inner cover

   f. If bees show signs of becoming unruly, puff more smoke over the tops of the frames.

   g. As frames are pried apart and removed, more smoke may be necessary to keep the bees calm.

   h. Use as little smoke as possible, but do not allow the bees to become excited. Work fast but gently; avoid bumping or scraping of the hive parts.

i. Too much smoke will make the colony totally disorganized and cause the bees not to resume active production for many hours.

3. Veil - is used to protect the head and neck from the bees.

a. The veil is made of a very closely woven, thin material such as sheer nylon or 10-mesh black steel wire.

b. The veil protects the beekeeper from the bees and also allows him to see to work.

c. The veil may be made with a cloth at the bottom to protect the neck and to pull the veil together at the bottom.

d. A broad rim hat is worn which keeps the veil out from the face and keeps the bees from stinging through the screen or sheer nylon net.

4. Clothing and gloves

The beekeeper should wear light-colored, tightly woven clothes. Overalls or coveralls could be worn over top of these clothes. All openings such as trousers and shirt cuffs should be closed. The beginner will probably want to wear tight-fitting leather gloves with long cuffs. This gives added protection. Usually after a person becomes accustomed to working with bees, he discards the gloves. Also, the coveralls may be discarded; however, they are a good added protection. It is necessary to wear tightly woven clothes.

5. Hive tool

The frames of the beehive are pried apart by use of a hive tool. Propolis, a substance similar to glue and produced by the bees, seals the frames together. The hive tool looks like a putty knife on one end and is curved on the other end. The hive tool is made of relatively strong, thin metal in order to stand the pressure of prying the frames apart. A thick putty knife may be used in place of a hive tool if necessary. When using the hive tool, the curved end should be used to scrape the propolis off the frames. The tool should be pulled toward the user. The reason for doing this is to do less damage to the frames.

6. Honey extractor

The purpose of the honey extractor is to extract, to withdraw, and to separate the honey from the comb by centrifugal force. The radial and reversible basket are two types of extracting machines used. Radial extractors vary in size from 12 frame per load capacity, all the way up to the larger extractors which can accommodate 50 frames per load. The extracting cycle takes from 12 to 20 minutes depending on the size of the machine. Three hundred (300) RPM's is the maximum speed reached by the radial extractor which extracts both sides of the comb at the same time.

The reversible basket extractor is different from the radial extractor but serves the same purpose. Two baskets support the comb during the extracting cycle. As the machine runs; centrifugal force acts on one side of the comb and then on the other side. You have to reverse the baskets holding the honey three or four times and turn them 180 degrees until all the honey is extracted from the comb. The extracting cycle for the reversible basket extractor is much quicker than that of the radial extractor. It only takes 2 to 4 minutes to extract the honey with the reversible basket extractor. Usually the reversible basket extractor handles four to eight frames. This is desirable so the extractor can be moved easily. However, reversible basket extractors come in sizes ranging from 2 frames per load to the larger models that can handle 16 frames per load.

7. Wax extractor

The most used type of wax extractor is the solar wax melter. It is a rectangular box that ranges in size from 1-½' by 3' to 2-½' by 14'. The depth of the melter box is not more than 5". The solar wax melter uses the heat from the sun to melt the wax. It is usually made of aluminum, and covered with glass.

PROJECT SHEET III

NAME OF PROJECT - Project 1.

Constructing a hive tool

MATERIALS

A piece of high carbon steel, such as an old saw blade, 2" x 11", an anvil, a source of heat which has the capability of heating to 1850° F., a grinding machine, a drill press with a 3/8" drill bit, and a triangle file with a handle, and a can of spray lacquer.

PROCEDURE

1. Heat one end of the spring steel to a cherry red, and bend the metal on an anvil by striking with a hammer to form a two-inch, round-cornered 90° angle to form the scraperblade.

2. Grind inclined plane angle on the outside edge of the scraper to form the scraper blade.

3. Grind two inclined plane angles back to back on the other end of the metal stock to form a wedge-shaped, thin probe on the hive tool. Further, grind a back to back inclined plane on the probe end to form a 1/8" angle on the probe end.

4. Grind the center portion of the hive tool to form a handle to fit the student's hand. CAUTION: The handle for the hive tool should be at least one inch wide and five inches long.

5. Use the wire brush on the grinde to remove rust from the hive tool, and use the file to smooth the surface and finish the hive tool.

6. Spray the hive tool with lacquer to retard rusting.

PROJECT SHEET III

NAME OF PROJECT - Project 2

Beekeeper's Veil

MATERIALS

Broad rim hat, 1 yd. sheer nylon, or #10 mesh wire, ½ yd. tightly woven net, 2' 1/8" rope, and thread.

PROCEDURE

Place the screen wire or sheer nylon over the top of the broad rim hat. This may be attached to the hat by use of thread or rubber band.

Broad Rim Hat
Screen Wire On Sheer Nylon

Attach the cloth to the bottom of the wire by using the thread. If screen wire is used, you need to attach the cloth and wire with heavy thread. Your mother, relative, or friend who can sew will probably be willing to help you with this.

Hat
Wire
Cloth
You

GLOSSARY III

HOUSING AND EQUIPMENT

Apiary - Place where bees and hives are kept.

Bottom Board - Support for other hive parts and landing area for bees.

Extracting Supers - Used for food chambers and storage of surplus honey.

Frames - Supports and holds comb for honey storage and brood nest.

Hive - Bee's home.

Hive Body - Brood chamber, full depth super, food chamber.

Hive Tool - Hand tool used for separating and cleaning hive parts.

Honey Extractor - Device used to extract honey from comb by the use of centrifugal force.

Honey House - Building used for storage of equipment and for extracting honey.

Inner Cover - Acts to insulate hive and escape board for removing honey.

Outer Cover - Acts to protect the hive from the weather.

Queen Excluder - Device for confining queen to a certain part of the hive.

Smoker - Instrument used to disorganize bees and cause less desire to sting.

Veil - Protective device for beekeeper's head and neck.

Wax Extraction - (solar wax melter). Rectangular box which uses heat of the sun to melt wax.

Wax Press - Device used to press wax solid from impurities.

REFERENCES FOR LESSON III

HOUSING AND EQUIPMENT

Beekeeping in Virginia, Publication 372, prepared by H. M. Amos, Blacksburg, Virginia 24061: Virginia Polytechnic Institute and State University, Extension Division, January 1970.

Beekeeping in West Virginia, Bulletin 33, Charleston, West Virginia 25305: West Virginia Department of Agriculture, 1966.

"Course 70, Beekeeping," Correspondence Courses in Agriculture and Home Economics, prepared by Walter W. Clarke, Jr., University Park, Pa. 16802: The Pennsylvania State University, College of Agriculture Extension Service, undated.

Pennsylvania Beekeeping, Circular 544, prepared by W. W. Clarke, Jr., University Park, Pa.: The Pennsylvania State University, College of Agriculture Extension Service, undated.

Super Market, 1971 catalog, Bee Supply, Clarkson, Kentucky 42726: The Walter T. Kelley Co., 1971.

U. S. Department of Agriculture. Selecting and Operating Beekeeping Equipment, Farmer Bulletin 2204, Washington, D. C. : Government Printing Office.

QUIZ III

HOUSING AND EQUIPMENT

Multiple Choice - Choose the best answer

1.) Propolis is a substance which is:

a. contained in the stinger of the bee.

b. used to glue the hive parts together.

c. useful in making honey.

d. contained in pollen.

2.) The standard shallow super holds

a. 30-40 lbs. of honey

b. 50-60 lbs. of honey

c. 70-80 lbs. of honey

d. 0-10 lbs. of honey

3.) The standard hive frame is

a. 20" x 10" x 2"

b. 22" x 9½" x 6"

c. 18 1/8" x 9 1/8" x 1 1/8"

d. 16 1/6" x 7 1/6" x 2 1/6"

4.) When using a smoker, too much smoke will:

a. Ruin the bellows on the fire pot

b. have no effect on the bees

c. cause the user to become sick

d. cause the colony to become totally disorganized and not resume active production for many hours

True - False

_____1. The honey house is used for storing equipment and extracting honey.

_____2. The bee veil protects the legs and feet of the beekeeper.

_____3. The hive tool is used to pry the frames apart in the hive.

_____4. Wax presses are usually too expensive for the small operator to purchase.

ANSWER SHEET FOR LESSON III

1. List and define the 7 main parts of the bee hive.

   1. Bottom board - supports other parts and acts as landing area for bees.

   2. Hive body - called brood chambers, fill depth super, and a food chamber. Young bees are raised in the hive body.

   3. Frames - used to hold comb in which brood is developing and in which honey is stored.

   4. Extracting supers - used as food chamber and for storage of surplus honey.

   5. Queen excluder - device for confining queen.

   6. Inner cover - Adds insulation for the hive and also acts as an escape board.

   7. Outer cover - Protects the hive from weather. Made of galvanized metal or aluminum.

2. What is a honey house? The honey house is simply a building used for the storage of equipment and for extracting honey.

3. What is a smoker? A smoker is a device used to puff smoke to the bees which causes the bees to eat the honey, in order to protect their food supply. When the bees are full of honey, they have less desire to sting.

4. What is a beekeeper's veil? A beekeeper's veil is a screen wire or mesh net cover over a large brim hat that protects the head and neck from bee stings.

5. What type of clothing should a person wear when working with bees? A beekeeper should wear light-colored, tightly woven, clothes. Overalls or coveralls can be worn over the top of these.

6. What is a hive tool and how is it used? The hive tool is used to pry the frames of the hives apart. This is also used to scrape the propolis off the frames.

7. What is a honey extractor? A honey extractor is used to separate the comb and the honey by use of centrifugal force. The reversible-basket and radial extractor are available.

8. What is a wax extractor? A wax extractor is used to melt the wax and thus separate the wax and honey. It may be a solar wax melter which is shaped like a rectangular box with a glass top.

ANSWER SHEET III

HOUSING AND EQUIPMENT

1. Propolis is a substance which is
   b. used to glue the hive parts together

2. The standard shallow super holds
   a. 30-40 lbs. of honey

3. The standard hive frame is:
   e. 18 1/8" x 9 1/8" x 1 1/8"

4. When using a smoker, too much smoke will:
   d. cause the colony to become totally disorganized and not resume active production for many hours.

True - False

1. True

2. False - bee veil protects the face and neck of the beekeeper.

3. True

4. True

ACTIVITY SHEET IV

SELECTING AND OBTAINING BEES

OBJECTIVES - After studying this individual lesson, the student will be able to:

1. List and give a brief description of two types of crossbred bees
2. Define packaged bees and their use
3. Explain what is meant by hiving a swarm
4. Define wild honey bees. List one reason for not using wild honeybees
5. List two commercial sources from which to obtain bees

WAYS AND MEANS

I. Study information sheet number IV. If you have any difficulty with the material, check the references, and then ask your teacher for help.

II. When you believe you understand the information, answer the following questions. These questions are to help you understand this lesson. Be sure to give a complete answer to each question.

1. What is a crossbred bee?
2. List two crossbred bees and two of their characteristics.
3. What is the recommended race of bee in Virginia?
4. What are packaged bees?
5. What is one of the first things you should do to package bees when they first arrive?
6. What is meant by hiving a swarm?
7. Are wild honey bees recommended for use by the beginning beekeeper? Why, or why not?
8. List two commercial sources of bees.

INFORMATION SHEET IV

SELECTING AND OBTAINING BEES

A. Breeds

A number of races of bees have already been mentioned in the first unit. However, there are only two recommended races. The recommended races are the Italian and Caucasian. Of these two, the Italian race is used most often in Virginia.

However, a number of different breeds of bees exist. These breeds come from crossing (mating) different races. This is just like having a white cow and a black bull, and the calf looks like both parents, usually with black and white markings. When a cross between two races or family lines of bees occurs, the new bee is called a crossbred bee. This bee is usually more healthy, active, and productive. The beekeeper may have crossbred bees in his colony without really knowing it because the bees may have already been crossed when he first got them or a different race may be nearby for them to cross-breed. However, due to the great number of Italian bees in the United States, and especially Virginia, one usually has to buy a crossbred queen in order to have crossbred bees in the apiary. Crossbred queens are specially produced and sold by commercial companies. Usually, the crossbred queens are slightly higher in price due to the cost of maintaining and producing them. (Crossbred bees are also referred to as hybrid bees).

The Starline hybrid, (crossbreed) and Midnight hybrid, (crossbreed) are the most used crossbred bees. Both of these breeds of bees are healthier, more active, and usually more productive than the Italian race.

The Starline hybrid tends to become ill-tempered after it is crossed with a natural breed. If the bees become ill-tempered (sting excessively), it is necessary to place a gentle queen in the hive (natural Italian) and the

offspring produced by her will be more gentle than the hybrid bee. Another crossbred honeybee is the Midnight hybrid. The Midnight hybrid is usually gentle and hard working. It usually stores good crops of honey and very seldom stings. Because it only stings infrequently, the Midnight hybrid is recommended for beginning beekeepers. The only drawback of the Midnight hybrid is that it tends to build up excessive propolis, and also to build bits of wax upon a comb or upon a wooden part in a hive. This building of wax bits on already built comb or on wooden parts of the hive is called building burr comb.

B. Package bees

Package bees are just what the name indicates. The bees are bought in a package or box, usually from a catalog supply house, and shipped directly to the customer. Usually the bees are ordered from a beekeeper in the South. The packaged bees should be ordered in January or February which means they will be delivered to the customer in March or April. The packages weigh from two to five pounds with each pound made up of 500 bees. The three-pound package of bees is recommended. If you install an entire colony of packaged bees, it will take then ten weeks to build up enough strength to begin storing honey. The package of bees may be ordered with or without a queen. The beekeeper would want to order a queen if starting a new colony; however, if you are going to use the package of bees to strengthen an old colony, one would not want to order a queen.

When the bees arrive, note their condition. If more than one-fourth of the bees are dead, one should indicate this on the shipping invoice so they may be replaced. Depending on the supplier, this shipping invoice (statement) can be sent to either the delivery company or bee company for replacement of losses.

Keep the packaged bees between 50° and 60° F. The bees will die if the temperature goes over 80° F. or if it goes below 45° F. Do not allow the package of bees to stand in direct sunlight. One of the first procedures that the beekeeper should take when the bees first arrive is to feed them. A thin sugar syrup is the best feed and can be sprinkled on the bees with a feeder can. One cup for a three pound package is about the proper amount. Too much syrup will drown the bees, so be careful.

Of course, package bees require regular beekeeping equipment, and this should be ready when the bees arrive. This equipment should include:

1. Complete hive with frames and full sheets of comb foundation
2. Either one large or two small supers
3. Feeding device (five-pound friction top honey pail)
4. Drawn combs

All of the equipment should be free of disease, molds, and stains. The combs should be clean. If the worker cell com's are used in place of frames of foundation comb, these also need to be clean and free of drone cells. Combs of worker cells will allow the package bees to build up faster and stronger than will frames of comb foundation.

Introducing package bees can be done in many different ways. In fact, it is a good idea to watch an established beekeeper introduce package bees before the student attempts to do it. The beginning beekeeper can learn much from the experienced beekeeper which will make the student's experience with package bees easier and quicker. The following steps are suggestions and you may discover a better way to introduce package bees after watching an experienced beekeeper.

When working with package bees to establish a new colony (queen included):

1. Take out four or five frames from the middle of the hive body.

2. Open the package of bees and remove the can of syrup and the queen cage. The can of syrup was placed with the bees when they left the place where they were bought. The queen cage houses the queen and contains candy for the queen to eat.

3. Place the queen in the hive first. Sprinkle the queen with syrup, so she cannot fly, remove her from her cage by pulling out the cork in the end of the cage and put her cage down on the bottom board of the hive. The queen should crawl out, go into the comb, and begin laying eggs immediately.

4. Sometimes it is a problem to get the rest of the bees out of the package. Shake the package over the place where the five frames were removed. Most of the bees will go out of the package when it is shaken very fast. If some if the bees hold on to the package, jar the package against the ground or hit it sharply with a tool. This should jar the bees into a corner of the package and then they can be emptied into the hive.

5. Put the five frames that were originally taken out back into the hive and slide them together.

6. Replace the inner cover and invert the feeder over the opening in the inner cover. Usually, the bees will begin to function as a normal colony within one or two hours.

NOTE: The best time to put package bees into a colony is in the evening and also when the temperature is moderately cool. This helps to restrict the bees from flying. Also, it is a good idea to sprinkle the bees with sugar syrup just before the package of bees is originally opened, again causing the bees to stop flying and helping to settle them down.

Another problem which is run into is the bees not knowing the location of their hive. This is especially true on bright, sunny, warm days when the bees rush out of the hive to gather nectar and do not really mark the location of their hive. When they return they drift into the wrong hive. By introducing the bees during cool weather and in the evening helps this problem greatly. This problem can be turned around so that it is helpful to the beekeeper. Hive locations can be switched so that bees will return to weak colonies, thus strengthening them. Bees from strong hives end up in weak hives and build them up. One of the biggest reasons for failure of package bees is the lack of food. Additional food must be given every four or five days until the bees begin to fill the combs

with honey. If the hive contains drawn combs, fill a 5-pound pail about 2/3 full of sugar syrup. If the hive contains full foundation, fill the 5-pound pail. If the colony is on full foundation feed them 20-25 pounds of sugar. Much less sugar is necessary if the colony is introduced on drawn combs about 10-15 pounds. If bees are placed on drawn combs and fed excessively or too fast, a number of unwanted things will happen:

1. The bees will crowd or overrun the brood nest.
2. Restricted egg laying by the queen will occur.
3. Development of the entire colony will be reduced. If the package bees are introduced during a heavy honey flow, the amount of sugar needed may be reduced by 1-2 lbs./feeding.

Extremely cold days are not good for introducing package bees into the hive. However, if bees are introduced into the hive on cold days, it is essential to work quickly, thus keeping the queen and other bees from becoming chilled. To introduce bees on cold days, use the same procedure as mentioned earlier, however, make sure the queen bee is covered by bees. By covering the queen bee, the workers will keep her warm. In rainy weather, the package bees may be introduced inside a garage or other building. These buildings should be as dark as possible and the temperature between 50° and 60° F. The only precaution here is to keep the hive entrance screened. When the weather is appropriate, the hive can be moved to its proper location and the screen removed.

C. Hiving a swarm

Hiving a swarm, a group of bees, is simply leaving a fully equipped hive with another beekeeper to allow his bees to enter the new hive. After the bees are established in the hive, one to two weeks later, one may transfer the hive to the desired location. The hive which was left for the bees to occupy should be fully equipped with frames of foundation or drawn combs. The bees in the new hive should be fed sugar syrup until all the combs in the brood chamber are filled. Requeening the newly hived

swarm should be done not later than one year after the hive enters the new hive body.

D. Wild Honey

Some people will be willing to sell an old non-standard hive of bees, a log with bees in it, or an old box of honey bees. It is not a good idea to purchase wild bees unless one can get them very cheap or free. The reasoning behind this is that the bees may be from a poor strain or breed of bees. In a number of years these bees may be producing very little, so you will have wasted money. These bees may be carrying disease. So, for these reasons, it is unwise to purchase wild bees. However, if you do decide to try wild bees, there are a number of procedures which should be taken:

1. Fill 3 to 5 combs with worker brood. The other frames should contain wax foundation or drawn comb. The pieces of worker brood should be placed tightly in the frame with rubber bands or string. These old worker combs should be removed later in the year as you can work them to the outside of the brood chamber. By having worker comb in the hive, the colony can get established quicker and more efficiently.

2. Place the new hive in front of the place from which the wild bees will come (log, old box, unstandard hive). Make the bees enter by using smoke. The transfer should be made before May 1. After the bees become established in the hive, relocate the hive to the desired location. Now the hive can be handled as if the wild bees were package bees as far as feeding is concerned.

If one plans to get wild honey bees from a non-standard hive, another method of transferring is recommended. Place the standard hive with frames and foundation over top of the non-standard hive. A few frames of dark honey in the new hive will help to attract the wild bees. Seal up all holes and openings in the non-standard hive except for one opening in the side or end. Leave only one way for the wild bees to go, hopefully into the new hive. Do not allow robbing. The new hive should be checked in about two weeks. If eggs or larvae are found in the new hive, this means that the queen has transferred and

begun laying in the new hive. Smoke the old hive thoroughly, pause for a minute, and then place a queen excluder between the two hives. In 21 days all the brood will have developed and moved from the old hive into the new hive. The new hive can now be located where desired and the non-standard hive burned and its contents put into beeswax. If the queen has not transferred from the old hive to the new one in two weeks, it will be necessary to leave the old and new hive together for another 1-2 weeks. After one month if the bees have not transferred to the standard hive, the colony and non-standard hive should be burned.

E. Commercial sources from which to obtain bees:

It is suggested that the student read other books and journals about beekeeping to help him with this study. The two most well-known journals include the:

1. Americal Bee Journal
   Dadant and Sons
   Hamilton, Illinois 62341

2. Gleanings in Bee Culture
   A. I. Root Co.
   Medina, Ohio 44256

Both of these journals will contain advertisements and articles concerning sources of bees. Along with the supply houses listed in these journals the following are highly recommended:

1. Dadant and Sons
   Hamilton, Illinois 62341

2. A. I. Root, Co.
   Medina, Ohio 44256

3. Walter T. Kelly Co.
   Clarkson, Kentucky 42726

4. Montgomery Ward and Co.

5. Sears, Roebuck and Co.

6. C. L. Stonecypher
   Box 212
   Homerville, GA

7. Hubbard Apiaries
   Onsted, Michigan

PROJECT SHEET IV

One of the most useful projects is visiting a local apiary and talking to its owner or beekeeper. On the visit, observe the beekeeper working and pick up the experiences which the beekeeper has had in his business. Before actually going to the apiary, one should call the owner and make arrangements to watch him do the following two items:

1. Introduce package bees into a hive
2. Hive a swarm

After watching either one or both of the above items write a 2-page report on what happened. Include in this report the following:

1. Precautions the beekeeper took before approaching the bees
2. Step by step description of procedures which he took
3. The way the bees acted
4. Anything unusual that happened (including the number of bee stings!)
5. Ways which the beekeeper may have done a better job. (Remember, it is a lot easier to talk about doing something than actually doing it.)
6. Thank the beekeeper for allowing the visit. If one is especially nice during the visit, the beekeeper may invite more students to visit.

GLOSSARY IV

BEES - SELECTING AND OBTAINING

Burr comb-small bits of wax comb deposited on top or between other comb or wood.

Breed - a kind or type of bees coming from the same background or origin.

Crossbreed - a cross of two different races or families of bees, (also referred to as hybrid).

Natural breed - no crossing of breeds has occurred; the Italian honeybee is a natural breed.

Packaged bees - bees purchased in a package or screened box from a commercial supplier. Usually there are 4500 bees per pound. A package may contain 2 to 5 pounds of bees.

Race - Bees coming from the same background; there are five main races, each having identifiable characteristics which tend to breed true.

Wild honey bees - honey bees which are not raised in an apiary generally those found in logs in a forest; (also called escaped bees).

REFERENCES FOR LESSON IV

BEES - SELECTING AND OBTAINING

Beekeeping in Virginia, Extension Division Publication 372, VPI & SU Blacksburg, VA 24061.

Beekeeping in West Virginia, Bulleton 33 Revised, Revised West Virginia Department of Agriculture, Charleston, W. VA 20305.

Pennsylvania Beekeeping, Circular 544, University Park, PA: The Pennsylvania State University, College of Agriculture, Extension Service.

Whitehead, Stanley B. and Shaw, Frank R., Honeybees and Their Management. D. Van Nostrand Co. Inc., New York, N.Y.

QUIZ IV

BEES - SELECTING AND OBTAINING

Multiple choice - circle the best answer.

1. The two recommended crossbred bees are the:
   a. Starlight and the Moonlight
   b. Sunlight and the Midnight
   c. Starline and the Midnight
   d. Moonlight and the Sunline
2. Crossbred bees are usually:
   a. less active than natural bees
   b. more active in the morning
   c. more healthy, active, and productive than natural bees
   d. less sick than natural bees.
3. Package bees should be ordered for March or April delivery by:
   a. October or September
   b. November or December
   c. May or June
   d. January or February
4. A pound of package bees contain:
   a. 4500 bees
   b. 3000 bees
   c. 5000 bees
   d. 10,000 bees

True - False

_____ 1. Package bees should be kept between 50^{o} and 60^{o} F.

_____ 2. Hiving a swarm means taking a hive from a neighbor's apiary without him knowing it.

_____ 3. Wild honey bees are always from a good strain or family of bees.

_____ 4. It is a good idea to buy an old log or old box with honey bees in it to put in your apiary.

ANSWER SHEET IV

BEES - SELECTING AND OBTAINING

ACTIVITY SHEET IV

1. Starline hybrid - a crossbred bee which may be commercially healthier, more productive, and more active and which may become ill-temepred after crossing with natural bees.

2. Midnight hybrid - a crossbred bee which may be commercially healthier, more productive, and a more active bee, usually gentle and hard-working. Stores good crops of honey and seldom stings. May build up excess propolis and burr comb.

3. What is the recommended race of bee in Virginia? Italian.

4. What are packaged bees? Bees that are bought in a package or box, usually from a catalogue and shipped directly to the buyer.

5. What is one of the first things you should do to package bees when they first arrive? One of the first things you should do (after seeing their condition), is to feed then a thin water sugar syrup. About 1 cup per pound of packaged bees.

6. What is meant by hiving a swarm? Hiving a swarm means leaving a fully equipped hive, including food and brood comb, with another beekeeper and allowing his bees which come from established colonies to enter your hive.

7. Are wild honey bees recommended for use by the beginning beekeeper? Why, or why not? Wild honeybees are not recommended for use by the beginning beekeeper.--The reason behind this is that these wild honey bees may be from a poor strain or family (line) of bees. These wild honey bees also may be diseased.

8. List three commercial sources of bees:

   1. Dadant and Sons
      Hamilton, Illinois 62341

   2. A. I. Root Co.
      Medina, Ohio 44256

   3. Walter T. Kelly Co.
      Clarkson, Kentucky 42726

ANSWER SHEET IV

BEES - SELECTING AND OBTAINING

ANSWER SHEET

QUIZ IV. (Multiple Choice and True - False)

1. The two recommended crossbred bees are the:

   c. Starline and the Midnight

2. Hybrid bees are usually

   c. more healthy, active, and productive than natural bees

3. Package bees should be ordered for March or April delivery by:

   d. January or February

4. A pound of package bees contain:

   a. 4500 bees

True/False

1. True

2. False - Hiving a swarm means leaving a fully equipped hive, including food and brood combs, with another beekeeper and allowing his bees which come from an established colony(s), to enter your hive.

3. False - It is not known what strain wild honey bees are from and they may be from a poor strain.

4. False - These bees may be from a poor strain of bees or diseased.

answers for ACTIVITY SHEET IV

1. What is a hybrid bee? - A hybrid bee is a bee which is a cross of two different races of bees or two different family lines.

2. List two hybrid bees and two of their characteristics.

ACTIVITY SHEET V

LOCATION OF THE APIARY

OBJECTIVES

At the end of Lesson V the student will be able to:

1. Identify all of the environmental factors involved in selecting the location of an apiary.
2. List the general sources of food and water for bees.
3. Arrange the hives of an apiary with the appropriate distance between them and the correct height from the surface of soil.

PROCEDURES

I. The student will study the Invormation Sheet V and complete one or more of the projects in this lesson.

II. The student should answer the following questions:

1. What are five factors of the environment that have a great effect on the apiary?
2. What are the two general sources of food for bees?
3. What are some of the plants in the beeyard that contain the above sources of food?
4. How far off the ground should hives be placed and what distance should there be between each hive?
5. How much distance should there be between the rows of hives?

INFORMATION SHEET V

LOCATION OF THE APIARY

The successful beekeeper must understand the needs of his bees in order to provide them with an ideal location. The beekeeper must know the need which bees have for feed and water. This need for feed and water demands the placing of the hive near sources of nectar, pollen, and water. The foraging area of the hive is sometimes called bee pasture.

Although honey bees are supplied some of the water they need from nectar, bees need more water to maintain health and to cool the hive. Locating the beehives near a good supply of water is necessary and makes good sense. Otherwise, the beekeeper would need to provide buckets of water for the bees. If the beekeeper must use buckets to water bees, corn cobs, or blocks of wood should be floated in the bucket to allow the bees to land and to drink water.

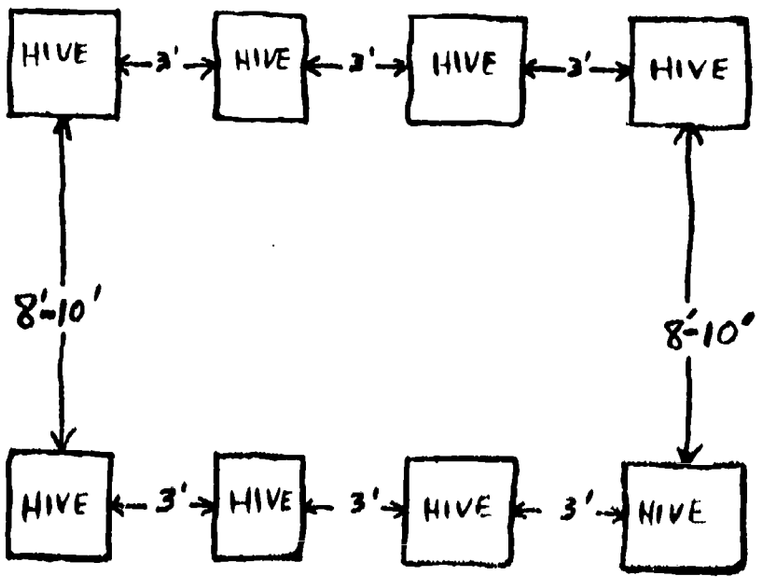
Weather conditions are very important to honey bees. Bees, like people, like warm sunshine in the morning, and cool shade in the afternoon. Therefore, the hive should face the southeast to allow the morning sun to warm the hive. Also, the hive should be located on a slope which will provide good air movement and water drainage. Such locations are enjoyable for bees.

A good windbreak is necessary for the apiary. A row of trees or a building will protect the hives from the chill of winter winds. Hive entrances should be faced away from winter winds.

When organizing the beeyard, the beekeeper should place the hives on sturdy stands in rows. The hives may be placed about eight (8) inches above the ground unless skunks or other pests cause problems. When pests are present in the apiary, the beekeeper should raise the hives sixteen to eighteen inches off the ground. Also, the beekeeper should place the hives so that nothing breaks the line of flight of the honeybees to and from the hive.

"Run for your lives-they just opened fire with gas warfare weapons!"

The beekeeper should make it easy for himself to work around beehives, and to get equipment and supplies to and from the apiary. The beekeeper should have plenty of room to work in the apiary if he leaves about three feet of space between each hive and eight to ten feet of space between each row of hives. The beekeeper needs a good access road to his apiary. The open space between the rows of beehives permits trucks and equipment to enter the apiary.



Typical spacing of hives in a beeyard

PROJECT SHEET V.

LOCATION OF THE APIARY

NAME OF PROJECT - Project I.

Organizing the apiary.

MATERIALS

Pencil and note pad.

PROCEDURE

1. Inspect a beeyard.
2. Check for the factors which were studied which were used in organizing the apiary.
3. Arrange the apiary according to information in Lesson V if the student owns the beeyard.
4. Prepare a list of changes needed in the beeyard if the student does not own the apiary.
5. Discuss the needed changes with the teacher. Note: Let the teacher discuss the changes with the owner because care must be exercised in telling someone that a change is needed in his apiary.
6. Make a list of all factors which were involved in organizing and arranging a beeyard.

PROJECT SHEET V.

LOCATION OF THE APIARY

NAME OF PROJECT - Project 2.

Locating food and water sources for honey bees.

MATERIALS

Pencil and note pad.

PROCEDURE

1. Check the apiary's bee pasture for sources of nectar.
2. Check the bee pasture for sources of pollen.
3. Locate as many water supplies as possible for bees to use.
4. List all of the sources of nectar and pollen that were located, and the time period during which each is available.
5. Estimate and briefly describe each source as to amount and distance from the apiary.
6. List the water sources, their abundance, and distance from the apiary.

PROJECT SHEET V.

LOCATION OF THE APIARY

NAME OF PROJECT - Project 3

Constructing and using an oversized cover which will shade and ventialte the hive during hot summer days.

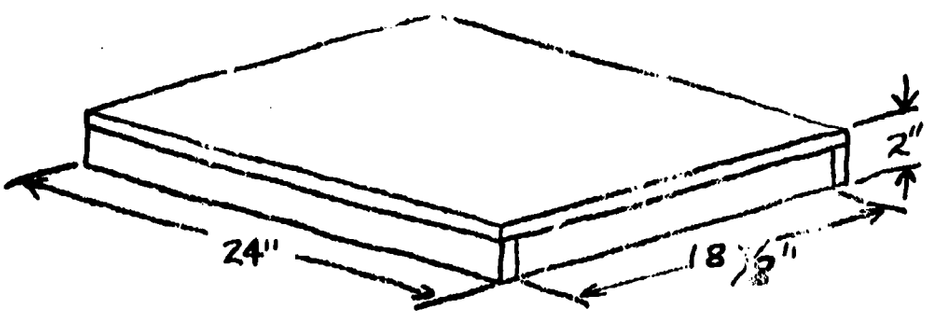
MATERIALS

Hammer, 6D nails or appropriate screws, carpenter's square, and wooden materials listed with the project plans, white exterior paint.

PROCEDURE

1. Cut the number of pieces of board needed to their correct size (See diagram).
2. Nail the 2 sides and 2 ends together in the manner demonstrated below.
3. Measure the frame to insure that it is square.
4. Nail the three top boards on the four sided structure that you have just assembled, in the manner demonstrated.
5. Paint the assembled cover with a good grade of exterior white paint.
6. Place the cover on a hive during hot summer days to provide shade.
7. Raise the cover about 2" at the rear of the hive.
8. Place a 2" wooden block or brick under the edge of the cover which will enable air to circulate through the hive and out the top near the rear.

Shade Cover Materials



3 pieces 20 1/8" x 3/4" x 8"

2 pieces 24" x 3/4" x 2"

2 pieces 18 5/8" x 3/4" x 2"

Note: If the cover has been made according to the plans, it will extend about 4" beyond the edges of a standard 10-frame hive.

PROJECT SHEET V.

LOCATION OF THE APIARY

NAME OF PROJECT - Project 4.

Constructing an entrance cleat to prevent mice from entering the hive during winter.

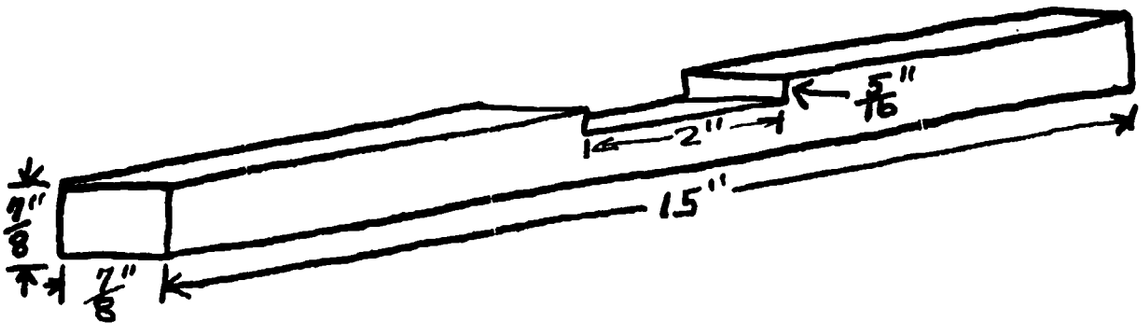
MATERIALS

Wood strip (approximately 7/8" x 7/8" x 15"), small hand saw, two small nails, wood chisel, and hammer.

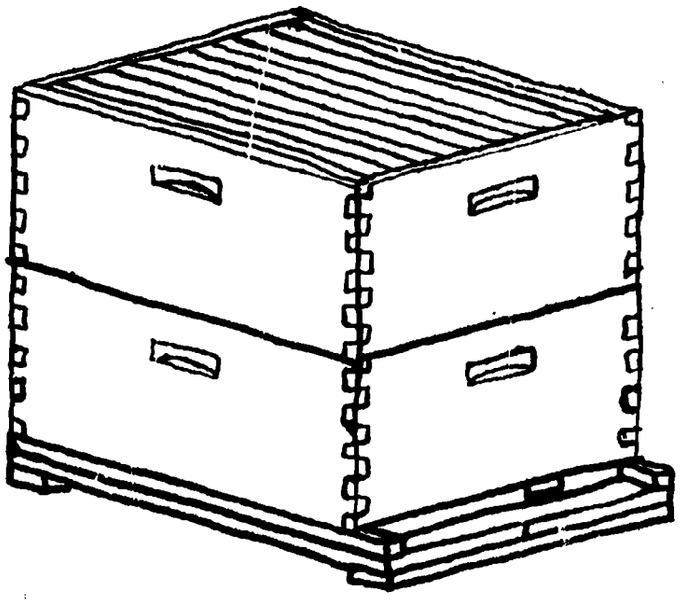
PROCEDURE

1. Cut the wooden strip to the length that will fit in the front entrance to the hive.
2. Cut to a depth of 5/16" - 3/8" at two points 2 inches apart on the wooden strip.
3. Place the wood chisel cutting edge perpendicular to the two cuts and between them.
4. With the chisel set directly between the two points where the cuts stopped, force the 2 inch chip off the wooden strip.
5. The constructed cleat should be painted with an exterior white paint.
6. Place the cleat in the entrance after the paint dries and nail it down tight with 2 small nails.
7. The cleat should fill the entire entrance except for the approximately 2" x 5/16" portion. This reduced entrance will allow the bees to work on warm winter days, and it will prevent mice from entering the hive.
8. The finished product should closely resemble the diagram on the following page.

NOTE: Entrance can also be reduced by placing wire over that is 3/8"-1/2" mesh size.



ENTRANCE CLEAT DIMENSIONS



ENTRANCE CLEAT INSTALLED

GLOSSARY V.

LOCATION OF THE APIARY

Apiary - beeyard or an area where beehives are located.

Bee pasture - area that the bees use for feeding where they have a supply of nectar and pollen.

Environment - conditions and surroundings which influence survival of bees such as sunlight, wind, rain, temperature, and plants.

Windbreak - group or line of trees or hedge, or buildings used to stop wind from disturbing bees and their hives.

REFERENCES FOR LESSON V.

LOCATION OF THE APIARY

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Beekeeping in Maryland, Extensior Bulletin 223, Prepared by Alfred Dietz and Dewey M. Caron, College Park, Md.: University of Maryland, Cooperative Extension Service, 1971.

Beekeeping in Virginia, Publication 372 (Revised) Prepared by J. M. Amos, Blacksburg, Virginia 24061: Virginia Polytechnic Institute and State University, Extension Division, 1970 .

Beekeeping in West Virginia, Bulletin 33, Prepared by W. H. Gillespie and Oscar M. Dick, Jr., Charleston, West Virginia 25305: West Virginia Department of Agriculture, 1966.

Pennsylvania Beekeeping, Circular 544 (revised), Prepared by W. W. Clarke, Jr., University Park, Pa., : Pennsylvania State University, College of Agriculture, Extension Service, 1971.

ANSWER SHEET V.

LOCATION OF THE APIARY

ACTIVITY SHEET, SECTION II:

1. What are five factors of the environment that have a great effect on the apiary? Wind, heat (sunshine), water, cold temperatures, slope of the land, wild animals.

2. What are two general sources of food for bees? Nectar and pollen.

3. What are some of the plants in your beeyard that contain these sources of food? Locust, tulip tree, maple, scurwood, clover, fruit blossoms, and weeds; e.g.: goldenrod, white aster, loostrife, thistle.

4. How far off the ground should hives be placed and what distance should there be between each hive? Hives should be at least 8 inches off the ground, and at least 3 feet apart.

5. How much distance should there be between the rows of hives? In the apiary, the rows of beehives should be from 8 feet to 10 feet apart.

True/False

1. F
2. F
3. T
4. F
5. T
6. T
7. F
8. T
9. T
10. F

QUIZ V.

LOCATION OF THE APIARY

True/False - Circle T for true; circle F for false.

T F 1. Bees need shade at all times of the day.

T F 2. Hives should be placed facing the northwest so that the bees will get warmth from the sun.

T F 3. Hives should be placed on a slope to allow easy air and water movement around the hives.

T F 4. Bees get most of the water that they need from pollen.

T F 5. Additional water that the bees need may be supplied in a bucket near the hives.

T F 6. Beehives should be placed in rows on sturdy supports about 8 feet apart and 3 feet between each hive.

T F 7. Bees enjoy and live easily where a strong wind blows.

T F 8. Hives may be raised to a height of 16"-18" off the ground if skunks or other small animals become pests.

T F 9. In the apiary, rows of hives should be 8-10 feet apart to enable pickups and trailors to travel between them.

T F 10. A building or hedge will not serve as a good wind break for the apiary.

ACTIVITY SHEET VI

SEASONAL MANAGEMENT

OBJECTIVES

Upon completion of this lesson the student will be able to:

1. Perform the necessary management practices that bees need during the spring.

2. Perform the necessary management practices that bees need during the summer.

3. Perform the management practices that are needed during the fall.

4. Determine whether or not winter management is necessary.

PROCEDURES

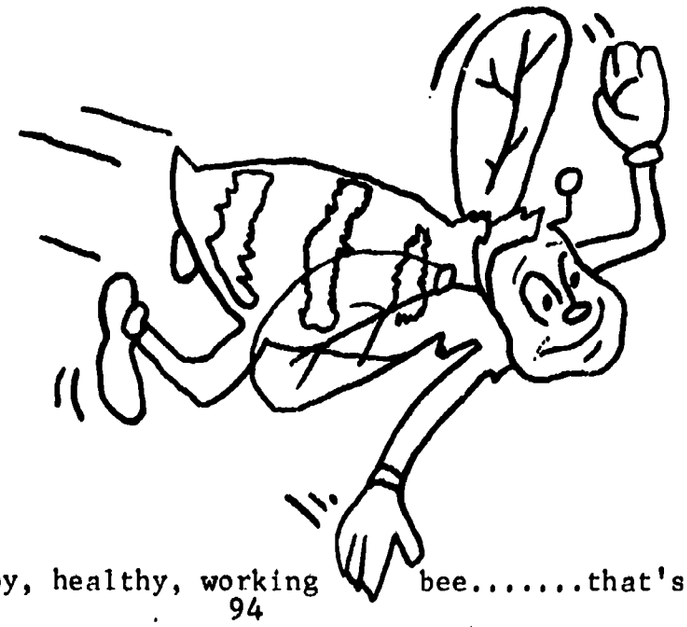
Study information Sheet VI. Answer the following questions. The student may need to read the references listed.

1. During which season of the year do bees require the least amount of management?

2. Which two seasons have similar management practices?

3. During which season do you prepare the bees for wintering?

4. During which season do you prepare the bees for working and preventing swarming?



"A happy, healthy, working bee.....that's me!"

INFORMATION SHEET VI

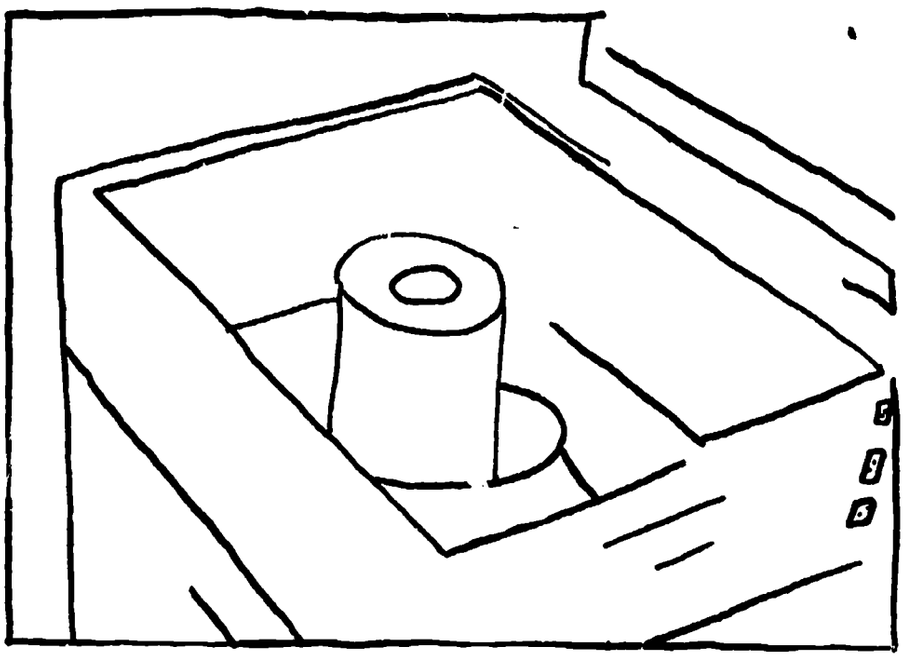
SEASONAL MANAGEMENT

I. Spring management

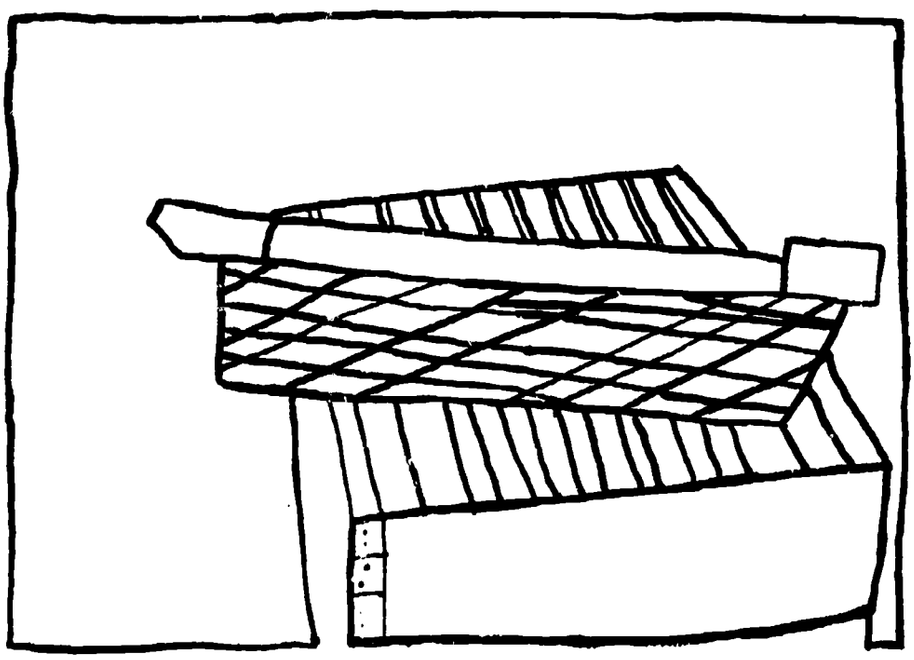
Your first visit to the hive should be made in late February or early March to see if the bees are alive. Return any dead colonies to the honey house. Check the amount of food stored by lifting the colonies. The light ones will be short of food and easier to lift. If any colonies are short of food, feed them granulated sugar, frames of honey, or soft candy. Not sugar syrup!

Remove any dead bees from the entrance and check all dead colonies for possible diseases. If a disease is present, destroy the comb and sterilize the equipment.

The second visit to the hives should be made when the bees are having frequent flights. The temperature should be over 50°. Again check for dead colonies and examine to see if the brood is free of disease. If their food supply is short, feed them sugar syrup at a rate of 1-½ parts sugar/1 part water (by volume). Use a 5 lb. friction top honey pail feeder (refer to figure 1) because the bees are at the top of the hive and do not go down to get food at the entrance in cold weather.



Friction Top Pail Feeder can is in place.



Division-board feeder replaces a frame in the brood nest.

- Weak colonies that cannot take care of themselves because they are queenless or have a small cluster should either be united with or placed on a double screen over a strong colony.

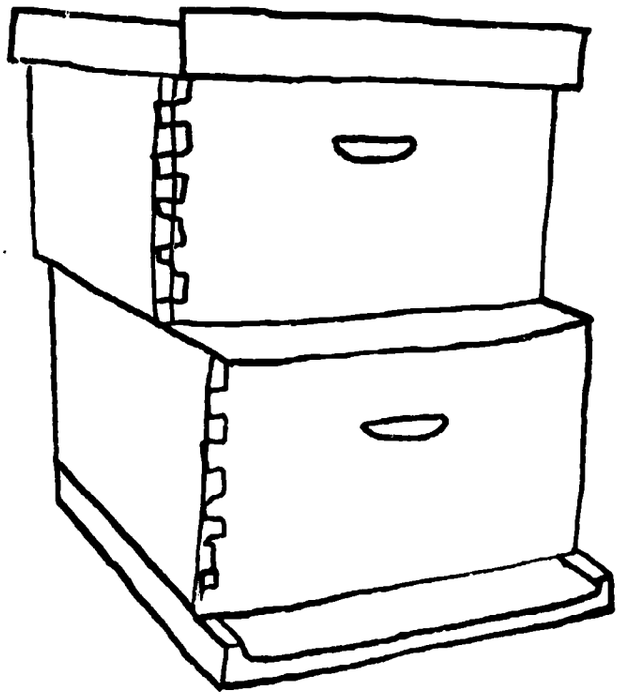
- To unite them (refer to figure 2) place the one with the strong queen on top of another with a sheet of newspaper between them. They will chew their way through and not fight.

(One good colony is better than several weak ones!)

"When you gotta go, you gotta go!"

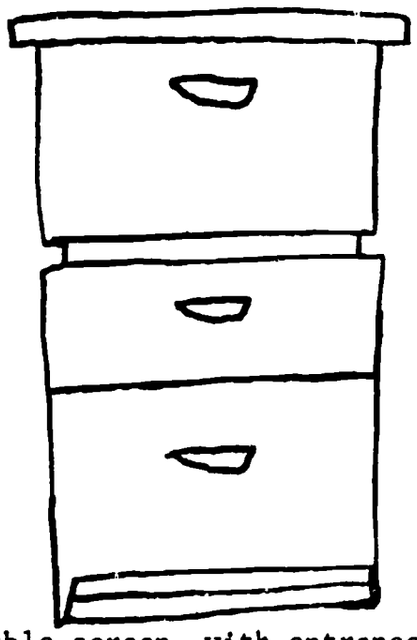
Two queens will not survive very long when two colonies are united; the weaker one will disappear.

-Fig. 2-



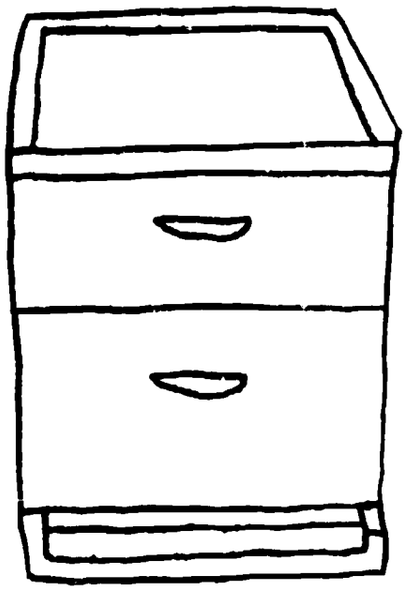
Introducing package bees
to strengthen weak colonies.

-Fig. 3-



Double screen, with entrance to
rear, is used to divide upper h
body from super.

-Fig. 4-



Double screen in place; used for uniting
colonies, rearing queens, requeening, and
making divisions.

Reverse hivebodies in late April. In a couple of weeks reverse them again. When both hive bodies are filled with honey or brood, a new super should be added. Do not use a queen excluder. The excluder is widely misused. It is usually placed in the colony too early so that bees hesitate to go into the supers. It is possible to operate bees without a queen excluder by top supering. Stop adding supers before the end of the nectar flow.

Dividing colonies is another change of great value in spring usually done at time of the fruit or dandelion bloom. Dividing can be done by removing 2 or 3 frames of brood and a queen and place them in a hive. Fill both hives with frames of comb and move this division to a new location. Reduce the entrance and feed the same as packaged bees. The old colony must be requeened and also fed.

Entrance cleats may be removed in May. Their purpose is to keep out mice. Active bees will take care of their own mice problems.

Requeening may be necessary in the spring.

A double screen is made by covering a ½-inch thick wooden frame with a layer of screen wire on the top and bottom side of the frame, (refer to figures 3 and 4). This prevents communication between the colonies and both queens will survive. The advantage of it is that heat will pass from the strong colony to the small colony and help keep them warm. The upper colony should have its entrance in the rear. When the colony grows strong and the weather becomes warm, the double screen may be removed and placed in its own new stand a mile or so away to prevent the bees from drifting back to the old location.

Another way to strengthen a weak colony is to exchange locations with a strong colony. The field bees from the strong colony enter the weak colony and give it strength to develop. The exchange may also stop swarming in the strong colony.

A good colony at fruit bloom should have the following conditions:

1. A productive queen - one which lays eggs in a uniform pattern with few drone cells.

2. Eight - ten pounds of bees; enough to cover about 10 frames.

3. Six - eight frames of brood - these are the bees which will produce honey in June.

4. More than 15 pounds of honey - this is about three full-depth frames or five shallow frames full of honey.

5. An ample and continuous supply of pollen or pollen substitute.

About one frame of honey and one frame of pollen are needed to produce one frame of brood.

6. Enough space for the storage of honey and rearing brood. Two shallow frames/day-honey. One full-depth frame for eggs will last about three days.

Examinations of the beehives must be performed, but not too often. In the spring, the hive must be checked to determine the need for feeding pollen or nectar substitute. Most beekeepers have found that spring feeding of bees is a necessity. Once spring feeding is started, the substitute pollen or nectar feed supply should be given to the bees until a source of natural pollen and nectar becomes available to the bees.

A mixture of soybean flour, brewer's yeast, and powdered, skimmed milk may be prepared and fed to bees as a substitute pollen. The food may be prepared in a ratio of 3:1:1, respectively. To feed the mixture, the pollen substitute is spread on a flat surface and sheltered from the rain.

To make the pollen substitute into a pollen and nectar substitute, a heavy sugar syrup is added. Then, the mixture is shaped into cakes. The cakes are fed by placing them on top of the frames above the brood nest.

II. Fall management

Fall is the time of year when bees must be gotten ready for winter. Some years ago, bees were placed in dark, cool cellars or in outbuildings and sheds during winter, but often this practice spread diseases. Some bees even returned to the summer locations and died which weakened the colonies. Experience has taught beekeepers to leave the bees on the summer stands.

Listed below are the steps that the beekeeper should follow in fall management. Each step will be explained later in the lesson.

1. Remove all empty or partly filled supers.

2. Requeen colonies left with old queens.

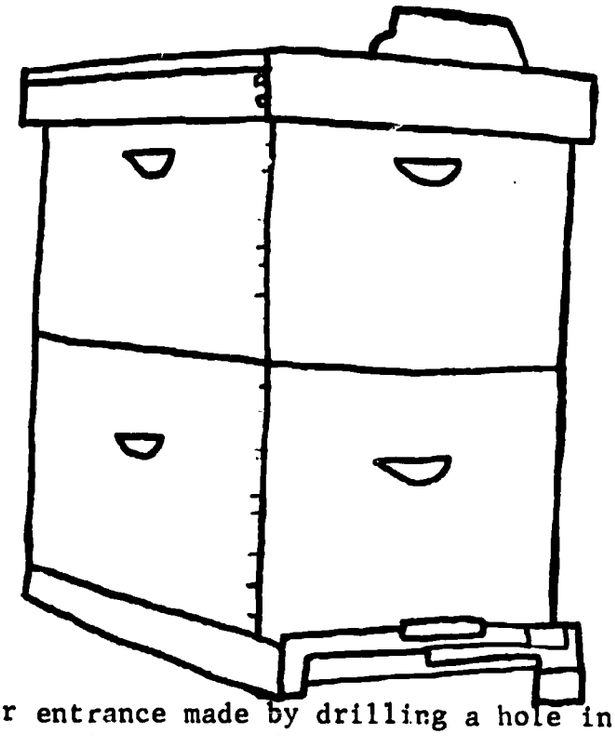
3. Remove queen excluders.

4. Be sure each apiary has good wind protection and is in a favorable location for wintering.

5. Provide each colony with sufficient food.

6. Be sure the quality of the food is good enough for successful wintering.

7. Wrap the hives with black roofing paper if they must be wintered in a cold or unfavorable location.



Upper entrance made by drilling a hole in the super. Lower entrance is protected from mice by an entrance cleat.

8. Provide each colony with top and bottom entrances, (see figure 6).

9. Protect the bees from mice with an entrance cleat, (see figure 6).

10. Unite weak colonies.

11. Do not try to winter diseased colonies or colonies suffering from spray poisoning.

III. Winter management

If bees are properly cared for in fall, no winter management will be necessary. It is best to leave the bees alone during winter, except to check for damage by mice, skunks, thieves, and windstorms.

IV. Summer management

If you have provided conditions for making strong colonies, you should work to keep the bees working and prevent swarming.

1. Provide plenty of storage space for nectar. Add a super before the last one is entirely filled.

2. Provide a shade board in locations where it is likely to be hot.

3. Provide the bees with water if there is none near the apiary. They will use it to cool the hive and then the honey when nectar is not coming in. If the bees have water they will be less likely to bother your neighbors.

4. You may need to remove Poplar Honey (dark honey) in June and place empty supers on the colonies for sourwood or basswood honey (light honey). A purer source of honey will retail at a higher price.

5. Near the end of the honey flow, do not oversuper (add on too much space) so that the bees will fill the combs better. Crowding late in the honey flow will not induce swarming as readily as in the build-up period.

6. Remove the honey crop with bee escapes or repellents. New honey usually sells well. Market it early.

7. Fumigate comb honey you plan to store more than a few days to prevent wax moths from destroying it. Repeat fumigation in ten days.

8. As soon as honey is removed from the combs, return the wet super to the bees in the evening for them to dry. It makes equipment less messy to handle for storage.

9. Check all colonies for disease and requeening late in the summer so the colonies will have plenty of young bees for wintering.

PROJECT SHEET VI

SEASONAL MANAGEMENT

NAME OF PROJECT - Project 1

Constructing a friction top pail feeder and installing it in the hive.

MATERIALS

5-lb. pail or larger, 4-penny nail, hammer lid, or metal cover for pail that fits snug, sugar syrup, complete hive, empty shallow super.

PROCEDURE

1. Make 6-10 holes in the lid of the pail with a 4-penny nail and hammer.

2. Fill the pail with sugar syrup made by following instructions in the information sheets for this lesson.

3. Place the lid on the pail and invert the pail over the hole in the inner cover in the hive.

   NOTE: A little syrup may run out but it will stop if the holes are not too large. The bees should have to suck the syrup out of the holes in the lid of the pail.

4. Put an empty super on top of the inner cover to protect the feeder.

5. Set the outer cover in place.

PROJECT SHEET VI

SEASONAL MANAGEMENT

NAME OF PROJECT - Project 2.

Performing management practices.

MATERIALS

Student's apiary or neighbor's apiary, veil, gloves, smoker, protective clothing.

PROCEDURE

1. If the student is working in his own apiary he will perform the practices using the information in this lesson as a reference.

2. If the student is using his neighbor's apiary, he may only be allowed to observe his neighbor performing seasonal management practices.

3. If the student is only allowed to observe and not participate, he should make a checklist of each practice observed and write a few remarks about each procedure.

4. If the student is working his own apiary, he will be observed by a beekeeper or his Ag. Ed. instructor who will evaluate his work.

5. The student should make a check sheet for each season to be used in the future season's management.

6. All of the preceding procedures should be completed and evaluated for each season's management of the hive.

GLOSSARY SHEET VI

1. Brood - bees which produce honey.

2. Double screen - a ½" frame usually with layers of screen wire on both top and bottom.

3. Entrance cleats - a piece of wood that can be attached or removed from entrance hive. When attached it should leave about 5/16" for bees to enter the hive and prevent mice from entering.

4. Friction top pail - metal bucket with holes in lid that when turned upside down holds sugar syrup for bees to suck out.

5. Hive body - usually the lower section of the hive or part on which the super is placed. It is here that the brood lives and is raised.

6. Oversuper - add too much space for honey.

7. Queen excluder - screen that is large enough for the worker bees to go from hive body up to super but small enough to keep queen from going up to super and laying eggs.

8. Requeened - adding a new queen in place of the old queen.

9. Sugar syrup - feed for bees made of 1-½ parts sugar/1 part H_2O by volume.

REFERENCES FOR LESSON VI

SEASONAL MANAGEMENT

Beekeeping, Circular 326 (Rev.), University of Arkansas, Agriculture Extension Service.

Beekeeping in Maryland, Bulletin 223, College Park, Maryland, University of Maryland, Cooperative Extension Service.

Beekeeping in Virginia, Publication 372, Blacksburg, VA, VPI & SU Extension Division.

Pennsylvania Beekeeping, Circular 544, University Park, Pennsylvania, Pennsylvania State University, College of Agriculture, Extension Service.

QUIZ VI

SEASONAL MANAGEMENT

Fill in the blank.

_____ 1. One good colony is better than several weak ones.

_____ 2. If two colonies, one strong and one weak, are united, both queens will live for a long time.

_____ 3. Bees should get their first visit from their keeper in late February or early March.

_____ 4. A weak colony cannot exchange locations with a strong colony successfully.

_____ 5. It is possible to disturb a colony too often in the spring.

_____ 6. Will a mixture of soybean flour, yeast, and skim milk take the place of natural pollen somewhat?

_____ 7. When dividing colonies is it advisable to requeen one of the new colonies?

_____ 8. Can active bees take care of their own mice problems during the growing season?

_____ 9. Where should bees be kept during the winter?

_____ 10. Should all colonies with old queens be requeened in the fall?

_____ 11. What is the object that is removed in the spring and replaced in the fall to keep mice from disturbing bees?

_____ 12. What can be done to hives if they are to be wintered in an unfavorable location?

_____ 13. What color is tutip Poplar Honey?

_____ 14. What happens if you over-super?

_____ 15. What can be done to prevent wax moths from destroying the comb?

ANSWER SHEET VI

SEASONAL MANAGEMENT

QUIZ Answers.

1. True.
2. False.
3. True.
4. False.
5. True.
6. Yes.
7. Yes.
8. Yes.
9. On summer stands.
10. Yes.
11. Entrance cleat.
12. Wrap in black roofing paper.
13. Dark brown.
14. Bees will not fill comb with enough honey.
15. Fumigate according to directions and repeat 10 days later.

Activity Sheet Answers.

A. Winter

B. Fall and Spring

C. Fall

D. Spring

ACTIVITY SHEET VII

MANAGEMENT OF THE HIVE

OBJECTIVE

After studying the information sheet and related material:

A. The student will be able to describe the proper procedures for introducing the new queen into a colony.

B. The student will be able to list three (3) procedures to prevent robbing in the apiary.

C. The student will be able to describe how to unite weak colonies of bees.

D. The student will be able to manage honey bees to prevent their starving during the winter.

PROCEDURES

I. Study Information Sheet VII. If the student experiences difficulty with this lesson, he should read the references for the lesson before asking the teacher for help.

II. After studying the information sheet thoroughly, the student should answer the following questions:

A. Outline the procedure for introducing a new queen into a hive.

B. List three reasons why robbing may occur in a colony of honey bees.

C. Explain the procedure for uniting colonies of honey bees.

D. Describe sugar candy and its usage.

INFORMATION SHEET VII

MANAGEMENT OF THE HIVE

REQUEENING

WHEN?

1. During the latter part of the honey flow for clover.
2. In September and October during the wild-flower honey flow.
3. During a light honey flow to minimize disturbance of the hive.
4. During the fall to allow the new queen to build a strong colony for the spring honey flow by laying eggs during the early spring.
5. During the warmest part of the day except when robbing is a problem.

WHY?

1. Good management. A queen should stay in the colony no longer than two years, even though she may live five or six years.
2. Swarming. Requeen a colony to prevent swarming.
3. Death. Queens may be killed by manipulation, robbers or pests.
4. Egg production. Young queen bees generally lay more eggs.

HOW?

In order to introduce a new queen, the beekeeper must find and kill the old queen. Sometimes finding the old queen may be quite a job. The beekeeper may locate the queen bee by using the following methods: (NOTE: You may remove the old queen, dequeening, by the use of Method #1, or Method #2. The hive is requeened by the use of Method #1).

De-queening

METHOD #1: Examining comb, 1 story hive.

Required conditions: Amount of brood small, population of colony small. Sufficient nectar flow to prevent robbing.

Procedure:

(1) Open hive with easy motions, very little smoke.

(2) Remove comb of food and set outside.

(3) Work toward center of brood nest; look for queen on the comb next in view within the hive before examining the comb removed. Catch queen with thumb and forefinger.

2 story hive:

(1) Place excluder between hive bodies.

(2) Remove comb of food from upper hive body and set outside.

(3) Work toward center of brood nest; look for queen on comb next in view within the hive before examining the comb removed. Set successive combs outside.

(4) Look on excluder, sides of hive body.

(5) If queen is not found in upper hive body, (expectancy to in spring) replace combs in pairs, looking between pairs before replacing.

(6) Set upper hive body off and repeat procedure on lower hive body.

METHOD #2: Moving the bees (down)

Required conditions: Sufficient nectar flow to prevent robbing.

Procedure:

(1) Place a hive body of empty combs on the bottomboard.

(2) Cover it with a queen excluder.

(3) Place an empty hivebody on top of the queen excluder.

(4) Remove combs from the colony, one by one and shake all adhering bees into empty hivebody; encourage bees to go down through the excluder with light puff of smoke.

(5) Catch the queen on the queen excluder or side of empty hive body.

METHOD #2: Moving the bees (up)

Procedure: (1) Drum bees up through a queen excluder. Catch the queen on underside of queen excluder.

Re-queening established colony

Required conditions: Colony rendered queenless, idealy, for 24 hours.

Procedure:
(1) Remove paper from candy end of queen cage.
(2) Make 1/8" diameter hole through candy.
(3) Insert queen cage between frames of sealed brood, screen side down.

Introducing package queen.

Required conditions: Queen with its own package.

Procedure:
(1) Take out queen cage.
(2) Spray bees lightly with water or light syrup and shake on to combs.
(3) Dip queen cage, containing queen and attendants, in water or light syrup.
(4) Pull the cork out of queen cage and place between combs, screen side down.
(5) Feed syrup.

The queen bee is now free to move around on the comb. Bees eat their way through the candy plug in the end of the mailing cage to release the queen. The bees are able to smell the queen through the wire cage. If the queen is placed in a weak colony, it may be necessary to remove more of the candy in the end of the cage so the bees can work through it easier. Attendant bees may be shipped with the queen, and they should be released before the queen is released.

For the next eight days, the colony should not be disturbed. After eight days, the mailing cage is removed, and the hive body is checked for eggs in the comb. Eggs indicate that the queen is producing. If no eggs are found, a new queen will have to be introduced.

PREVENTING ROBBING

Robbing is a problem which all beekeepers must face. When robbing occurs, (a group of bees trying to take honey from another group of bees), the bees being robbed try to protect their store of honey and many bees may be killed during the fight. The strength of the colony can be greatly changed as a result of the fighting. The movements of robber bees may be noticed easily. The robber bees' movements are quick, and they hurry around the hive corners and hive entrance. The robber bees do not stop on the alighting board, but rather they rush into the hive. Robbing is aggressive food gathering, when nectar sources are scarce.

There are a number of causes for robbing. These include:

1. Leaving honey exposed near the apiary.
2. Feeding a colony improperly.
3. Covering the hive poorly.

The first action for the beekeeper to take to prevent the robbing is to stop handling the bees or to stop opening the hive. The beekeeper should remove the comb and honey that has been exposed to the robbers from the apiary. Other actions to take to prevent robbing include placing a bunch of wet grass or weeds over the entrance to the hive being robbed, or reducing the size of the hive entrance to about two inches wide. The beekeeper may brush a mixture of 2% carbolic acid and kerosene on the outside of the hive to stop the robbing.

UNITING COLONIES

For a number of reasons, a bee colony will become too weak to survive. Reasons for colonies becoming weak include:

1. wintering.
2. robbing.
3. swarming.

When a colony becomes weak, two things, hand feeding and adding sealed brood, may be ways to strengthen the colony. However, it is usually best to unite a weak colony with a strong colony rather than feeding the bees and adding sealed brood. Always unite a weak colony with a strong colony. Never combine two weak colonies. The procedure for uniting a weak colony and a strong colony is as follows:

1. Remove the top and inner cover from the stronger hive.
2. Punch 6 penny nail holes in two sheets of paper and place the paper over the hive.
3. Place the hive of the weaker colony, with the bottom board removed, on top of the paper. (Uniting colonies should be done late in the day to prevent robbing).
4. Use a shade board on top of the hive if the sun is hot the next day.

5. The two queens will fight. One will remain in the hive.

6. The worker bees will become acquainted by gnawing through the newspaper. This will prevent their fighting.

7. Remove the hive which was on top of the newspaper after twenty-four hours if it is empty.

8. Check the progress the bees are making toward uniting if the top hive is not empty. The bees may need assistance from the beekeeper.

PREVENTING CHILLED AND STARVED BROOD

If the brood in the hive become chilled they will die. Normally, the temperature between two frames of brood is 92° - 97°. The best way to prevent chilling of the brood is to supply the bees with plenty of heat producing food. Providing the bees with enough food prevents their starving, and insures that the brood will have enough food.

The bees keep themselves and the hive warm by clustering together. Their metabolism of sugar heats the hive and keeps the brood and the bees themselves warm. Fifty-five pounds of honey will be used by the bee colony during the winter for food and brood rearing. At least nine full frames of honey will be needed to equal 55 lbs. of honey.

Impurities such as pollen grains, sugar crystals or dust cause the honey to crystallize or become hard. Honeydew and some fruit juices contain large amounts of waste material and will cause dysentery in bees. To overcome dysentery, bees should be fed 10 pounds of thick sugar syrup.

Feed the bees in the fall after the first killing frost. (Granulated honey is wholesome food for bees; they need water to liquify it. Condensation on the inside of the hive is not a suitable source----bees should have access to water when feeding on granulated honey). The reason for feeding the bees at this time is because flowers stop secreting nectar after this time of the year. Sugar syrup should not be fed to bees when the temperature is below 50° because the syrup will crystallize and close up the holes in the feeder. Sugar syrup can be made as follows:

white granulated sugar--2 parts, by volume
hot water--1 part, by volume
cream of tartar--1 level teaspoon to each 20 lbs. of sugar

INSTRUCTIONS: Heat until all the sugar is dissolved, but DO NOT BOIL. Let the syrup cool until it is luke warm, and then place it over the bees by use of the bee feeder.

The above feed is recommended for late fall and early winter. During the coldest winter months, it may be necessary to feed the bees. A sugar candy-type can be easily made for bees:

15 lbs. of sugar
3 lbs. of glucose or white corn syrup
4 cups of water
½ teaspoon of cream of tartar

INSTRUCTIONS: Mix all ingredients and allow them to boil. The temperature should rise to at least 242° F. Cool the syrup down to 180° F. and beat until thick. Pour the candy into molds. The molds should be 8" x 10" x 3", and lined with wax paper. Hardened candy should be placed in the super just above the cluster of bees. The candy will provide a good source of feed to the bees during the cold part of the winter. In March or April, the candy should be removed and sugar syrup fed again, on an as needed basis.

Dry granulated sugar can be fed to the bees when the weather is warm enough for them to fly and to gather moisture. Usually the sugar is placed on the inner cover with the hole in the inner cover open. Bees have been known to survive the entire winter on dry granulated sugar.

PROJECT SHEET VII

MANAGEMENT OF THE HIVE

NAME OF PROJECT - Project 1

Making a wire cage for introducing a new queen into a colony.

MATERIALS

Queen cage, screen wire - one foot square

PROCEDURE:

1. Place the queen cage on the piece of screen wire.
2. Cut the screen wire 2½ inches wider than the queen cage, and about 5" long.
3. Place the queen cage lengthwise on the middle of the screen wire.
4. Bend the screen wire tightly over the sides and one end of the queen cage to form a cage with the bottom and one end open.
5. Remove four or five strands of cross-wires of the two bent sides and end to permit the cage to be slipped into the honeycomb.

PROJECT SHEET VII

MANAGEMENT OF THE HIVE

NAME OF PROJECT - Project 2

Observing a beekeeper introduce a queen into a hive and unite two colonies.*

MATERIALS

Pencil and note pad

PROCEDURE

1. Plan the visit with the beekeeper so that he knows that the student desires to watch the introduction of a queen into a hive, and the uniting of colonies.

2. Be willing to assist the beekeeper and to take instructions from him.

3. Take note on the activities of the beekeeper.

4. Report the learning experience to the class or at an FFA meeting.

*Note: This project may not be accomplished by one visit.

PROJECT SHEET VII

MANAGEMENT OF THE HIVE

NAME OF PROJECT - Project 3

Completing cross-word puzzle

MATERIAL

Pencil and enclosed puzzle

PROCEDURE

1. Complete the puzzle by filling in the empty spaces with words which complete the definition of the reference phrases listed under "ACROSS," and "DOWN."

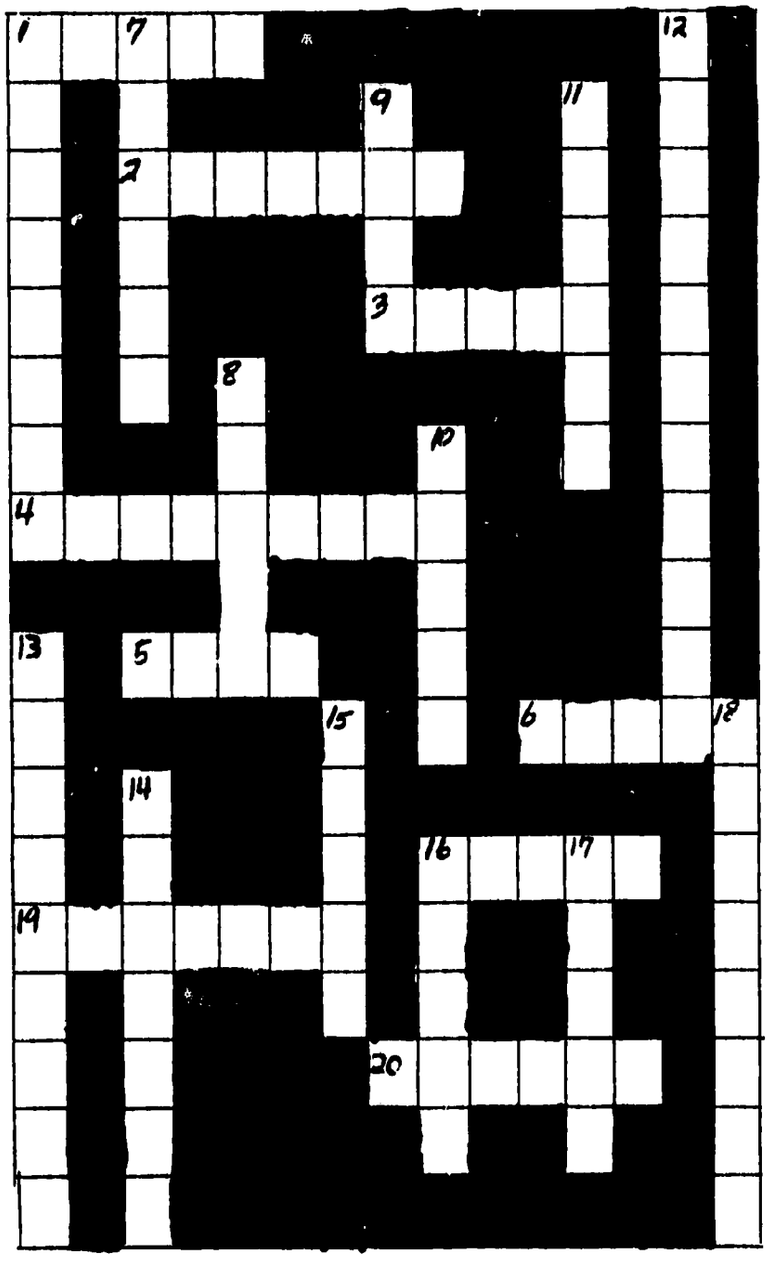
ACROSS

1. Sweet material produced by bees from the nectar of plants.
2. A large group of bees hanging together.
3. Developing bee in the worm stage.
4. Device for separating honey from the comb.
5. Mass of six-sided cells made by the honeybee in which food is stored and young bees raised.
6. Male bee.
16. A group of Apis Mellifica.
19. Home of the bee.
20. Female bee with incomplete reproductive parts and who does all the work.

DOWN

1. Apis Mellifica (spelled as one word)
7. Liquid secreted by plants which bees use to make honey.
8. Group of bees that leave hive to establish a new colony.
9. One unit of comb.
10. Rectangular device for holding comb in the hive.
11. Collection of a number of colonies of bees or a bee yard.
12. Process of fertilizing plants; transfer of pollen.
13. American or European disease.
14. Wax produced by bees.
15. Female bee which lays eggs.
16. Developing egg, larvae, and pupae.
17. Storage unit for extra honey.
18. Device to keep queen bees from entering the super.

PUZZLE VII



CROSSWORD PUZZLE ANSWERS

Across

1. Honey
2. Cluster
3. Larva
4. Extractor
5. Comb
6. Drone
16. Bees
19. Beehive
20. Worker

Down

1. Honeybee
7. Nectar
8. Swarm
9. Cell
10. Frame
11. Apiary
12. Pollination
13. Foulbrood
14. Beeswax
15. Queen
16. Brood
17. Super
18. Excluder

GLOSSARY VII

MANAGEMENT OF THE HIVE

2% Carbolic acid - very dilute acid used with kerosene to repel bees.

Granulated sugar - ordinary household sugar which is composed of small grains or crystals of sugar. (Also called sucrose).

Requeening - a process or management practice of replacing an old queen with a younger queen.

Robbing - the act of bees from one colony stealing honey from another colony of bees.

Sugar candy - a feed for bees in the winter which is made of 15 pounds of sugar, 3 pounds of white syrup, 4 cups of water, and ½ teaspoon of cream of tartar.

Sugar syrup - a solution used as bee feed in late fall and early winter; made of 2 parts white granulated usgar and 1 part hot water.

Uniting colonies - the process of joining a weak colony with a strong colony.

REFERENCES FOR LESSON VII

MANAGEMENT OF THE HIVE

Pennsylvania Beekeeping, Circular 544, prepared by W. W. Clarke, Jr., University Park, Pa. The Pennsylvania State University College of Agriculture, Extension Service, 1971.

U. S. Department of Agriculture. Beekeeping in the United States, Agriculture Handbook No. 335 Washington, D. C. : Government Printing Office, August, 1967.

U. S. Department of Agriculture. The Thermology of Wintering Honey Bee Colonies, Technical Bulletin no. 1429 Washington D. C.: Government Printing Office, November 1971.

QUIZ VII

MANAGEMENT OF THE HIVE

Multiple Choice

1. The first step in introducing a new queen is to:

   a. Put a queen excluder on the empty hive body.
   b. Shake the bees into the empty hive.
   c. Allow the colony to become quiet.
   d. Remove all frames.

2. Robbing may be successfully reduced by:

   a. Placing a bunch of wet grass or weeds over the entrance to the hive that is being attacked.
   b. Removing the entire hive.
   c. Using 92% Carbolic acid and kerosene on the outside of the hive.
   d. Leaving the hive alone.

3. Reasons for weak colonies include:

   a. Bad weather.
   b. Wintering, robbing, swarming, failing queen.
   c. Disease.
   d. Too much space between frames.

4. The best way to prevent chilling of the brood is to:

   a. Leave the hive alone.
   b. Ventilate the hive.
   c. Cover the brood with cloth .
   d. Supply the bees with enough heat producing food.

True - False

_____ 1. When requeening, after the old queen is found, she should be killed.

_____ 2. When robbing occurs, a group of bees try to take honey from another group of bees.

_____ 3. Always unite a weak colony with a strong colony of bees.

_____ 4. During the winter, a colony of bees will need about 55 lbs. of honey to survive until spring honey flow begins.

ANSWER SHEET VII

MANAGEMENT OF THE HIVE

Activity Sheet, Section II, A:

1. List the procedure for introducing a new queen.

   a. Kill old queen.
   b. Push loose ends of wire cage over brood.
   c. Remove cork from queen cage. (Make sure to douse queen with water or light syrup so she will not fly away).
   d. Push queen cage (mailing cage) into introducing cage.
   e. Force wire cage into comb tightly to hold mailing cage.
   f. Check in eight days to see if queen is laying. If not, one will have to add another new queen.

2. List three reasons for robbing:

   a. Leaving honey exposed near the apiary.
   b. Feeding a colony improperly.
   c. Covering the hive poorly.

3. Explain the procedure for uniting colonies:

   a. Remove top and inner cover from the stronger hive.
   b. Punch 6 penny nail holes in two sheets of paper and place the paper over the hive.
   c. Place the hive of the weaker colony, with the bottom board removed, on top of the paper.
   d. Allow the two queens to fight; only one will remain in the hive.
   e. Worker bees will become well-acquainted as they gnaw through the paper.
   f. Remove empty hive on top of paper.

4. Describe sugar candy and its usage:

   Sugar candy is used as an emergency food for bees during the winter. It is made as follows:

   15 lbs. of sugar
   3 lbs. of glucose or white corn syrup
   4 cups of water
   ½ teaspoon of cream of tartar

   Heat to 242° F. Cool to 180° F. and beat until candy is thick. Put in molds 8" x 10" x 3" to allow candy to harden.

QUIZ VII

Multiple Choice	True/False
1. c	1. F
	2. T
2. a	3. F
	4. T
3. b	
4. d	

ACTIVITY SHEET VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

OBJECTIVES

At the end of Lesson VIII, the student will be able to:

I. Recognize the symptoms or signs and the treatment for:

1. American foulbrood
2. European foulbrood
3. Sacbrood
4. Nosema
5. Paralysis
6. Isle of Wright disease

II. Perform preventive measures for pests:

1. Mice
2. Birds
3. Skunks

III. Recognize the danger of Wax Moths and treatment.

IV. Recognize the possible dangers of:

1. Robber flies
2. Spiders
3. Ants
4. Bee lice

V. List the measures that can be taken to prevent poisoning of bees by insecticides.

PROCEDURES

I. Study Information Sheet VIII. If the student experiences difficulty with the lesson, he should read the references for the lesson before asking the teacher for help.

II. When the student has studied the information sheet thoroughly he should answer the following questions:

A. Which disease causes the greatest amount of damage to bees in the U.S.?

B. What is the best preventive treatment for European foulbrood?

C. Which pests attach bee hives during the cold months?

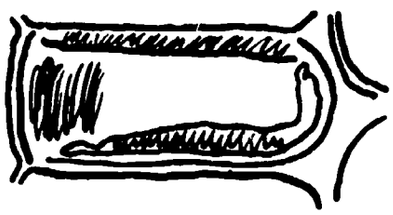
D. What is the parasite that is the most prominent enemy to bees?

DISEASES, PESTS, PARASITES, AND PESTICIDES

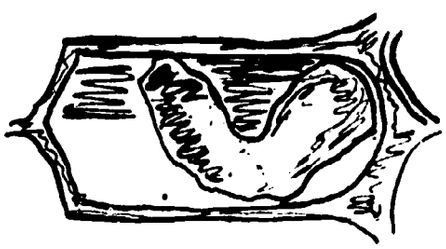
American Foulbrood

American foulbrood affects only the larvae and pupae in the cells, not the mature bees. Combs of brood will be capped incorrectly and many of the caps will be dark or sunken. Much of the dead brood will be uncapped and flattened down on the lower wall of the cell. The dead larvae usually turn light brown then dark brown. The dead brood cannot be removed by the bees without chewing out the comb.

The chief cause of the spread of the disease is robbing. It is also spread by the beekeeper who transfers diseased combs or supers.



Longitudinal view of a scale formed by drying of dead larva from American foulbrood.



Longitudinal view of a scale from dried larva - from European Foulbrood

Longitudinal view of a scale from dried larva caused by Sacbrood

"I need all the help I can get."

Treatment

The contents of a diseased colony should be burned, but if the hive is to be preserved it should be scraped free of wax and propolis and be scrubbed with soap and water. All tools, supers, etc. that have been used in the diseased colony should be scraped clean and washed carefully in boiling water. The bottom board should be washed with one part formalin or household bleach to four parts water.

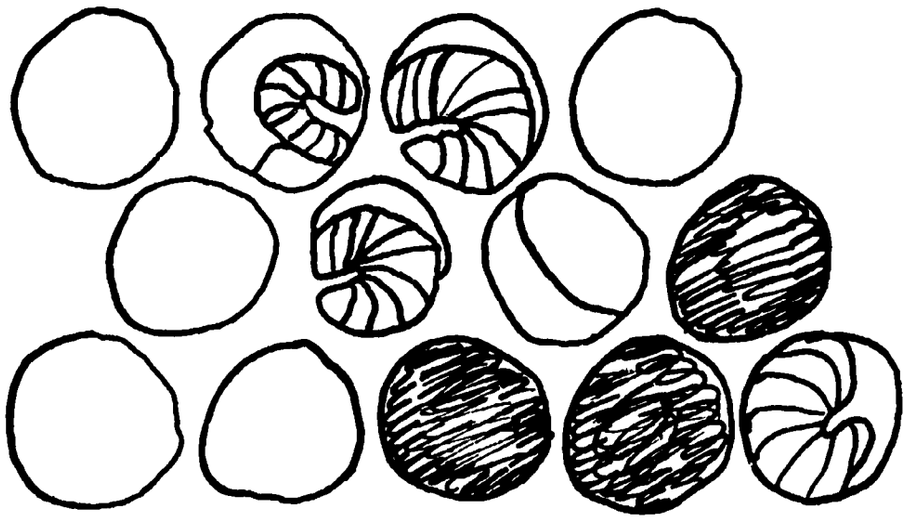
(The only way to be sure to eliminate the disease is to kill the bees at night and burn the entire contents of the hive.).

If many colonies are infected, all of them should be treated. A clean hive should be prepared for each colony to be saved and the bees driven into the hives. Place 10 frames in each hive before the bees are driven or shaken into it. Feed each colony a 5 lb. pail of sugar syrup containing sulfatliazol in the morning; drive the bees in the clean hive in the afternoon. To prepare the syrup dissolve 7.5 grain, ½ gram pill of sulfathiazol in ½ cup warm water, then boil and mix it with one gallon sugar syrup. As soon as the bees are in the new hive, feed them a second pail of sugar syrup with sulfathiazol. To kill bees, place a tablespoon of calcium cyanide into the entrance of the hive late in the evening after all flight has stopped. DO NOT BREATHE THE FUMES FROM THE CYANIDE!

The best practice for American foulbrood control is to detect it early before it spreads to other colonies and treat with TM25, TM10, or TM5 form of terramycin and remove all the sealed honey. Dust the colony four times at 4-7 day intervals with the terramycin.

European Foulbrood

Only a few of the dead larvae survive long enough to be capped over. Therefore, there are not as many sunken caps as with American foulbrood. Many of the larvae are curled on the bottom of the cell. They remain curled on the bases or bottoms of the cells rather than lengthwise on the lower walls of the cells as in American foulbrood. Some of the dead larvae are rough or bent in shape especially when lengthwise in the cells. The dead larvae turn yellow, then brown, and a few larvae may be seen clinging to the sides or tops of cells as well as on the bottoms. Instead of a sickening odor, as in the case of the American Foulbrood, European Foulbrood has an offensive sour smell.



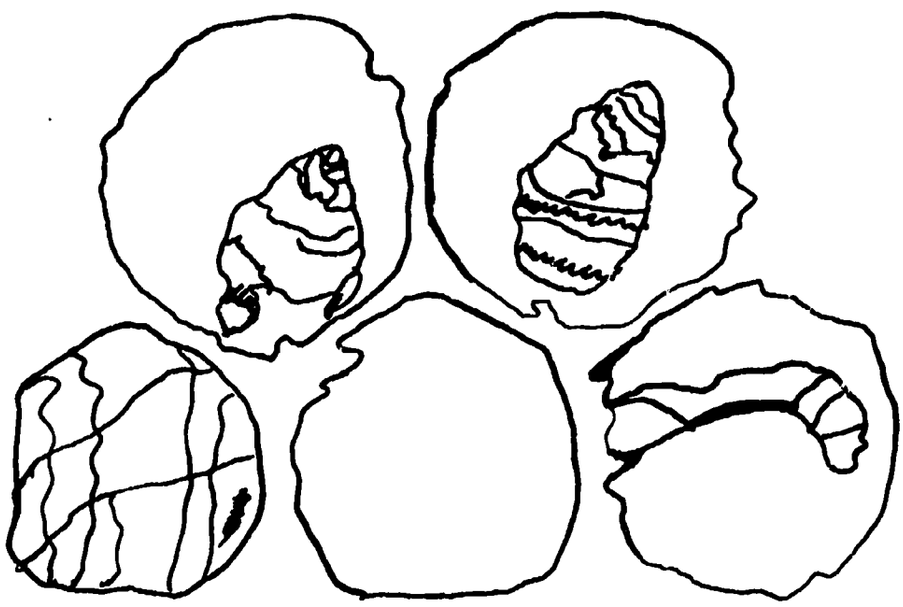
Larvae injected with European Foulbrood

Treatment

Pure Italian bees are normally resistant to European foulbrood. They rarely allow this disease to make any headway in the brood. Prevention, therefore, consists of keeping only pure Italian stock and of keeping all colonies strong and well fed. With proper disease preventive measures, slight cases of European foulbrood usually disappear at the beginning of honey flow. Infected colonies should be treated with terramycin. Dust the colony four times as described for American foulbrood. No further treatment should be necessary. A preventive treatment should be given all colonies in the apiary early the following spring. All honey must be removed from the colony after treatment and may not be used for human food.

Sacbrood

Sacbrood is less destructive and very much less contagious than foulbrood. When the colony is short of young nurse bees or the weather is damp and cold for some length of time, sacbrood is most troublesome. The diseased larvae turn gray and black, sometimes a grayish brown. Unless the disease persists, no control will be necessary. The bees usually clean the diseased material out as the honey flow begins and the disease disappears. It seldom becomes serious.



Dead larvae infected by Sacbrood.

Paralysis

Paralysis attacks adult bees only. They appear to be very weak and in pain. The bees often tremble and appear partially paralyzed. They crawl slowly in front of the hive with jerky motions and may die in small clusters. In advanced stages of the disease, honeybees appear shiny or greasy, and the hair on the body of the bees seems to be worn off.

The beekeeper should requeen the colony to cure disease.

Nosema

There are no easily observed symptoms to cause the beekeeper to suspect that the disease is present. Nosema is most severe during April, May, and June. It disappears or nearly disappears during mid-summer, then gradually builds up again during the winter months. Heavily infected colonies seem to have a shortage of adult bees in comparison to the amount of brood. The adults sometimes have slightly swollen abdomens.

The only treatment at the present time is to feed the infected colonies about one gallon of sugar syrup containing Fumidil B, by mixing ½ gram of Fumidil B with 6 gallons of syrup. Feed it during April or May. This treatment helps to control the disease in heavily infected apiaries. Although the treatment is not 100% effective, feeding the mixture during April and May strengthens the colony.

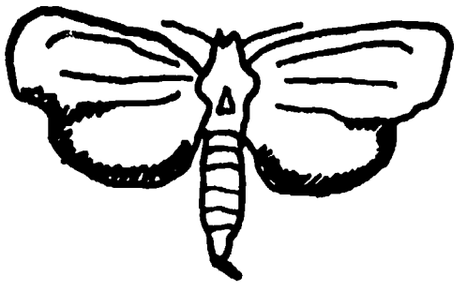
Isle of Wright Disease

Isle of Wright is caused by a mite. The mite causes paralysis of the flight muscles. During epidemics of this so called disease many colonies die. The disease is not found in this country but is a problem to beekeepers in Europe and South America.

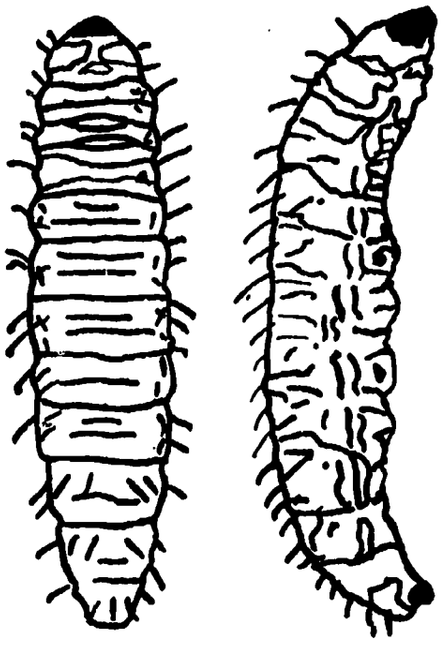
Pests

Mice are very destructive to combs in hives in winter. An entrance to the hive that is not over 3/8" in depth will usually keep mice out of the hive. If the entrance is larger, a strip of wire netting of 3/8" or ½" mesh over the entrance will keep mice out. Keep the top and bottom covered with a queen excluder or other type of cover so mice cannot enter the stored supers.

Adult female of the greater wax moth.



Larvae of the greater wax moth



Dorsal view Lateral view

Robber Flies

Occasionally, robber flies bother bees by catching them while in the air, but such instances are rare.

Spiders

Bees may become entangled in webs if spiders are allowed to build nests near the hives. When spider webs are near the apiary, the webs and spiders should be destroyed. The blackwidow is a hazard to the beekeeper, often nests under the hive carer. STAY ALERT.

Ants

These insects are annoying and perhaps steal some honey. They nest in corners where bees cannot reach them to kill them. They are often found between the lid and the inner cover. If the hole is left open in the inner cover, the bees will keep the ants out of the hive. A nest located near the apiary should be destroyed with chlordane. Ants should be attacked with bait, screened to exclude bees, and poisoned.

Bee Lice

These pests are of no economic importance in this country. They are so small they are seldom noticed. No control is necessary.

POISONING

Poisoning of pollinating insects by insecticides is one of the most important factors limiting availability of bees for pollination.

To hold bee losses to a minimum:

1. Unnecessary dusting and spraying should be avoided by careful scouting and timing.

2. Spray and dust under good weather conditions and avoid drift.

3. Use insecticides least toxic to bees.

4. Confine the bees to their hives during and after using pesticides to prevent or reduce losses of bees. Colonies can be confined by covering with wet burlap or tarpaulins for two days or more.

5. Provide fresh water close to the apiary to prevent bees from watering in contaminated areas.

6. READ THE LABEL--BE CAREFUL!!!!

Group 1-Hazardous

Aldrin
Arsenicals
Azinphosethyl (Ethyl Guthion*)
Azinphosmethyl (Guthion*)
Azodrin*
Banol*
Bay 39007 (Baygon*)
Bay 41831 (Sumithion*)
Benzene hexachloride (BHC)
Bidrin*
Bomyl*
Carbaryl (Sevin*)
Chlordane
Chlorthion*
Ciodrin*
Diazinon
Dicapthon
Dichlorvos (DDVP)
Dieldrin
Dimethoate
Dinitrobutylphenol (DNOSBP)
EPN
Famphur (Famophos*)
Fenthion
Heptachlor
Imidan*
Isobenzan (Telodrin*)
Isodrin
Lindane
Malathion
Matacil*
Methyl parathion
Methyl Trithion*
Mevinphos (Phosdrin*)[2]
Naled (Dibrom*)[2]
Parathion
Phosphamidon
Pyramat*[3]
Sabadilla
Tepp[2]
Zectran*
Zinophos*

Group 2-Moderately Hazardous

Carbophenothion (Trithion *)
Chipman RP-11974 (phosalone)
Chlorobenzilate
Coumaphos (Co-Ral*)
DDT
Dimetilan
Disulfoton (Di-Syston*)
Endosulfan (Thiodan*)
Endothion
Endrin
Methyl demeton
Mirex
Perthane*
Phorate (Thimet*)
Ronnel
Tartar emetic

Group 3- Relatively non-Hazardous

Allethrin
Amitrole
Aramite*
Bacillus thuringensis
Binapacryl (Morocide*)
Bordeaux mixture
Captan
CDAA (Randox*)
CDEC (Vegedex*)
Chlorbenzide (Mitox*)
Copper oxychloride sulphate
Copper 8-quinolinolate
Copper sulfate (monohydrated)
Cryolite
Cuprous oxide
Dalapon
Demeton (Systox*)
Dexon*
Dicamba (Banvel D*)
Diclone (Phygon*)
Dicofol (Kelthane*)
Dilan*
Dimite* (DMC)
Dinitrocyclohexylphenol (DNOCHP)
Dinocap (Karathane*)
Dioxanthion (Delnav*)
Diquat
Dodine (Cyprex*)
Dyrene*
EPDC (Eptam*)
Eradex*
Ethion
EXD (Herbisan*)
Fenson
Ferbam
Folcid (Difolatan*)
Folpet (Phaltan*)
Genite 923*
Glyodin (Glyoxide*)
IPC*
Kepone*
Maneb
MCPA
Menazon
Methoxychlor
Monuron
Morestan*
Mylone*
Nabam(Parzate*)
Nemagon*
Neotran*
Nicotine sulfate
NPA
Olancha clay
Ovex (Ovatran)*
Paraquat
Phostex*
Pyrethrin
Pyrolite
Rotenone
Ryania
Schradan (OMPA)
Sesamin
Sesone

Sillica gel (SG-78)
Simazine
Strobane*
Sulfur
Sulphenone*
TDE (Rhothane*)
Tetradifon (Tedion*)
Tetran*
Thiram (Arasan*)
Toxaphene
Trichlorfon (Dylox*, Dipterex*)
Zineb
Ziram
2, 3, 6-TBA (Trybsen*)
2, 4-D
2, 4, 5-T

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[1]Terms followed by an asterisk (*) are trade names of proprietary products.

[2]Mevinphos (Phosdrin*), naled (Dibrom*), and tepp have short residual activity and kill only the bees contacted at time of treatment or shortly thereafter. They are usually safe to use when bees are not in flight; they are not safe to use around colonies.

[3]Usually, losses to sabadilla are low enough to be no problem. Sabadilla should not be applied to open flowers that are freely visited by bees.

Bees have reportedly been destroyed by the king bird or bee martin. Since this is a valuable insect eating bird, it should not be killed. In the queen rearing yards birds might catch queens while they are out to mate. The use of a new queen may be necessary if this situation develops.

Skunks

The night travelers sometimes scratch upon the alighting boards in front of the hives and eat the bees as they come out to investigate the disturbance. Packed dirt and a muddy bottom board is a good indication of the presence of skunks. Damage to the colonies of bees by skunks may be controlled by trapping the animal or fencing around beehives with poultry wire to prevent the skunks' access to the hives. A little screen wire on the ground underfoot will convince the skunk that a trap has been set, cutting short its visit at the hive.

PARASITES

Wax Moths

Wax moths are the most prominent enemies of the bees. However, they do render a service when they destroy neglected combs on which bees have died of American foulbrood. There are two wax moths; the greater and the lesser moth. The moths lay their eggs and as the larvae hatch, they feed on the combs. If the bees are busy during honey flow, they may overlook the worms for a short time. The bees will remove wax moths from the hive when the flow is over, and they are not so busy.

The best way to protect combs from moths is to maintain strong colonies that will protect the comb. If the beekeeper plans to treat the combs to kill the larvae, he should use carbon disulfide or orethylene dibromide. The beekeeper should follow instructions for using these compounds, and apply two treatments about two weeks apart.

PROJECT SHEET VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

NAME OF PROJECT - Project 1.

Checking for foulbrood.

MATERIALS

Toothpick, combs of brood, veil, gloves, protective clothing, smoker.

PROCEDURE

1. Check combs to see if they are capped correctly.
2. Are any of the caps sunken or dark colored?
3. If there is dead brood lying on the lower walls of the cells, stick a toothpick in the larvae.
4. Is there a brown, stringy material that sticks to the toothpick as you remove it?
5. If the above examples are true of the brood you are checking, it is highly possible that your bees are infected with foulbrood (American).
6. Are most of the dead larvae uncapped?
7. Are the dead larvae on the bottom of the cells rather than the lower walls?
8. Are the dead larvae yellow or brown in color?
9. Is there a sour smell coming from the brood?
10. If the above answers to questions 6-9 are yes, it is very likely that you are witnessing a case of European foulbrood.

A COMPARISON OF SYMPTOMS OF VARIOUS BROOD DISEASES OF HONEY BEES

Symptom	American foulbrood	European foulbrood	Sacbrood
Appearance of brood comb.	Sealed brood. Discolored, sunken, or punctured cappings.	Unsealed brood. Some sealed brood in advanced cases with discolored, sunken, or punctured cappings.	Sealed brood. Scattered cells with punctured cappings, often with two holes.
Age of dead brood.	Usually older sealed larvae or young pupae.	Usually young unsealed larvae; occasionally older sealed larvae.	Usually older sealed larvae; occasionally young unsealed larvae.
Color of dead brood.	Dull white, becoming light brown, coffee brown to dark brown or almost black.	Dull white, becoming yellow-ish white to brown, dark brown, or almost black.	Grayish or strae- oolored becoming brown, grayish black, or black; head end darker.
Consistency of dead brood.	Soft, becoming sticky to ropy.	Watery to pasty; rarely sticky or ropy.	Watery and granular;tough skin forms a sac.
Odor of dead brood.	Slight to pronounced glue odor to glue-pot odor.	Slightly to penetratingly sour.	None to slightly sour.
Scale Characteristics	Uniformly lies flat on lower side of cell. Adheres tightly to cell wall. Fine, threadlike tongue of dead pupae adheres to roof of cell. Head lies flat.	Usually twisted in cell. Does not adhere tightly to cell wall. Rubbery.	Head prominently curled up. Does not adhere tightly to cell wall. Lies flat on lower side of cell. Rough texture. Brittle.

PROJECT SHEET VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

NAME OF PROJECT - Project 2. Checking for a decreasing number of bees.

MATERIALS

Bee hive, smoker, gloves, veil, and protective clothing.

PROCEDURE

1. If the bees in a hive are decreasing in number, use the following indicators to identify the cause:

   a. Packed dirt on a muddy bottom board is an indication that skunks have been present.

   b. Finding a number of webs near your hive indicates that spiders may be catching some bees.

   c. Gnawed marks on the beehive during cold winter months; check hives for mouse damage to comb. A strip of 3/8" or 1/2" mesh wire screen placed over the entrance to the hive will keep mice from endangering the beehive.

PROJECT SHEET VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

NAME OF PROJECT - Project 3.

Treatment of Foulbrood.

MATERIALS

Soap, boiling water, formalin, bleach, cyanide, sulfathiazol, terramycin, materials for burning the contents of hives, and correct protective clothing.

PROCEDURE

1. Observe a neighborhood beekeeper treating for foulbrood before you undertake the task.

2. Observe how he washes all equipment and tools.

3. Observe him burning the contents of the hive.

4. Note his preparation of syrup treatments, dusting treatments, and cyanide poisoning.

5. List some of the safety precautions he practices in his treatment.

GLOSSARY VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

1. Bee martin - bird that preys on insects and may eat queen bees.
2. Calcium cyanide - poison that is used to kill diseased bees.
3. Chlordane - pesticide that can be used to kill ants by treating their nests, if away from apiary.
4. Formalin - disinfectant type of material used for washing bottom boards.
5. Funidil B - a treatment for nosema that mixes with sugar syrup.
6. King bird - preys on insects; may eat queen bees.
7. Sulfathiazol - water soluble treatment for American foulbrood.
8. Terramycin - an antibiotic available in several forms; TM-25, TM-50, etc., for treatment of both American and European foulbrood.

REFERENCE FOR LESSON VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

1. Beekeeping in Maryland, Extension Bulletin 223, College Park, Maryland: University of Maryland, Cooperative Extension Service.

2. Beekeeping in Virginia, Publication 372, Virginia Polytechnic Institute and State University, Extension Division.

3. Correspondence Courses in Agriculture and Home Economics, University Park, PA; The Pennsylvania State University, College of Agriculture Extension Service.

4. Pennsylvania Beekeeping, Circular 544, University Park, PA: The Pennsylvania State University, College of Agriculture, Extension Service.

QUIZ ON LESSON VIII

True or False

_____ 1. American foulbrood affects the mature bees.

_____ 2. When treating a colony that is infected with American foulbrood, the contents of the hive should be burned.

_____ 3. In addition to burning the contents of the hive, all of the infected bees should be killed at night to avoid drifting of disease-laden bees to other hives and robbing of contaminated honey by bees from other hives.

_____ 4. Pure Italian bees are normally resistant to European foulbrood.

_____ 5. Bees are not capable of removing diseased material from the hive to help control disease.

Fill in blanks with correct words.

6. Paralysis attacks _____ bees only.

7. During the winter months, _____ are very destructive to combs and should be excluded.

8. _____ sometimes travel at night, scratch on hives, and eat the bees as they come out.

9. _____ render a service when they destroy neglected comb infected with foulbrood, but they are also a prominent enemy to bees.

10. _____ is one of the most important factors limiting availability of bees for pollination.

ANSWER SHEET VIII

DISEASES, PESTS, PARASITES, AND PESTICIDES

Activity sheet, PROCEDURES, Section II.

A. American Foulbrood
B. Use pure Italian bees
C. Mice
D. Wax Moth

II. Quiz VIII

1. False
2. True
3. True
4. True
5. False
6. Adult
7. Mice
8. Skunk
9. Wax Moths
10. Poisoning

ACTIVITY SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

OBJECTIVES

I. After studying the information sheet and related material,

A. The student should be able to identify the types of plants which yield nectar from which honey bees produce quality honey.

B. The student should be able to harvest, to process for sale, to store, and to prevent spoilage of honey.

C. The student should be able to package and to label honey for sale.

D. The student should be able to restore honey to its original quality after crystallization has occurred.

PROCEDURES

I. The student should study Information Sheet IX, and complete Project Sheet IX. If the student experiences difficulty with this lesson, read the references and consult an apiarist, or a commercial honey processing plant before asking the teacher for help.

II. When the student understands the material presented in this lesson, he should complete the following:

A. Locate a commercial honey processing plant, and write to them for information about the way they process honey for sale.

B. Answer the following questions:

1. List five plants which grow near the school from which the honey bee gathers nectar to make high quality honey.

2. What are the grades of table honey?

3. What are three factors which reduce the quality of honey?

4. Outline the process to follow when restoring honey to its original condition once it has crystallized.

INFORMATION SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

A. Producing high quality honey

1. Table honey - honey which has a good flavor of one major flower source which can be readily marketed for table use in all parts of the country.

a. Grades

(1) White and lighter honey
(2) Extra light amber
(3) Light amber
(4) Other table honey

b. Grades of honey

(1) Established by comparing the honey to a sample
(2) Established by the Commodity Credit Corporation

c. Bees produce table honey from nectar of the following plants which grow in Virginia:

(1) major, white clover
(2) major, curled and musk thistle
(3) black locust, good source, but unpredictable
(4) blacksbeer, good source
(5) sour wood, good source, but unpredictable
(6) minor, basswood (linden)
(7) none, star thistle, west coast plant
(8) minor, soybean blossoms, dehisee in late bud stage, very little bee visitation.
(9) minor, sweet clover, secretes nectar only on sweet soil
(10) vetch, smooth, hairy. Crown vetch on cuts and fills, does not secrete nectar

2. Non-table honey

a. Honey which has a major flavor of limited acceptability for table use.

b. Honey which is considered suitable for table use only in the location in which it is produced.

c. Non-table honey is produced from nectar of the following plants which grow in Virginia:

(1) tulip poplar, excellent source
(2) dandelion, spring bee food
(3) fall, fall aster
(4) minor, buckwheat, very small acreage
(5) fall, goldenrod
(6) minor, wild cherry

SHOWING NECTAR SOURCES BY AREA AND SEASON IN VIRGINIA

EASTERN VIRGINIA

Name of Plant	Blooming Period
Black gum	April 10 to April 25
Tupelo gum	April 15 to April 30
Blackberry	April 20 to May 10
Tulip poplar	April 20 to May 15
Holly	April 30 to May 15
Crimson clover	May 1 to May 15
Sweet pepperbush	May 10 to May 20
Gallberry	May 18 to June 15
Sourwood	June 10 to July 5
Sumac	July 15 to August 1
Goldenrod	August 25 to October 10
Aster	September 25 to October 30

SOUTHWEST VIRGINIA

Tulip poplar	May 15 to Junc 7
Black locust	May 15 to June 7
Blackberry	May 20 to June 3
Persimmon	May 22 to June 10
White clover	May 30 to July 20
Sweet clover	June 8 to August 1
Basswood	June 20 to July 10
Sourwood	June 25 to July 25
Buckwheat	July 23 to August 29
Aster	August 30 to October 10

NORTHERN VIRGINIA

Redbud	April 20 to April 28
Black gum	April 30 to May 20
White clover	April 30 to August 4
Alsike clover	April 20 to July 25
Crimson clover	May 4 to May 30
Black locust	May 5 to May 15
Tulip poplar	May 5 to June 10
Vetch	May 5 to June 20
Blackberry	May 10 to May 30
Privet	May 18 to June 4
Persimmon	June 1 to June 18
Sweet clover	June 10 to July 15
Smartweed	July 14 to November 4
Blue thistle	July 10 to July 30
Sumac	July 30 to August 15
Goldenrod	August 20 to October 20
Aster	October 5 to October 20

CENTRAL VIRGINIA

Redbud	April 10 to April 18
Alsike clover	April 10 to July 15
Black gum	April 20 to May 10
White clover	April 20 to July 25
Black locust	April 25 to May 5
Crimson clover	April 24 to May 20
Tulip poplar	April 25 to May 30
Vetch	April 25 to June 10
Blackberry	April 30 to May 20
Privet	May 8 to May 25
Persimmon	May 22 to June 8
Sweet clover	June 1 to July 5
Sourwood	June 15 to July 15
Smartweed	July 4 to October 25
Sumac	July 20 to August 5
Goldenrod	August 10 to October 10
Aster	September 25 to October 10

3. Factors which reduce quality of honey

   a. Floral species which produce an undesirable nectar such as:

      (1) Bitterweed
      (2) Broomweed
      (3) Carrot
      (4) Chiquapin
      (5) Onion

   b. Percentage of moisture in honey:

      (1) Moisture content should be between 17.1 and 18.5% to be desirable honey

      (2) Moisture content below 17% increases the granulating tendency of honey

      (3) Moisture content above 18.5% increases the rate at which honey will ferment

      (4) Tendency of honey to ferment increases as honey granulates

   c. Storage of honey at an unfavorable temperature for a period of time long enough for off-flavoring or darkening to occur

4. Retarding granulation of honey

   a. Heat the honey rapidly to the 160° F. temperature

   b. Stir the honey while heating

   c. Remove the honey from the heat when it has been held at the correct temperature for no longer than 30 minutes.

   d. Strain the liquid honey through a double thickness of cheesecloth or mesh nylon netting.

   e. Place the honey in a container and seal the container

   f. Cool the honey quickly to prevent loss of flavor and change in color

5. Production of comb honey

   a. Four types of comb honey

      (1) Bulk - produced in shallow extracting frames which have been provided with super foundation

      (2) Cut - bulk honey which has been cut into pieces

      (3) Chunk - cut comb honey packed in a container and filled with extracted honey

      (4) Section - requires special honey supers with wooden sections to produce quality honey

b. Comb honey production requires minimum preparation for sale

B. Harvesting honey

1. Hobbyist operation

a. Selling honey

(1) Sell in a container such as a bottle, glass jar, plastic box, or a window carton

(2) Purchase a commercial label to use on the container to identify the product

(3) Comb honey production may be the most feasible, though requires greater skill in colony management.

b. Managing the business - use practices for a commercial operation as stated below:

2. Management practices of the commercial producer of honey

a. Provide a honey house for harvesting and processing honey

b. Insure that bees cannot enter the building

c. Provide space inside of the building for off-loading the filled supers in a closed-in area

d. Save labor and time by unloading supers with the truck bed at floor level.

e. Construct the interior of the building with easily washable surfaces.

f. Have concrete floors in the building

g. Provide adequate lighting and ventilation in the processing building. Do not place exposed light over the extractor.

h. Use skid boards on trucks to ease labor involved with loading, stacking, and off-loading supers

i. Use proper heat in processing and packaging of honey to retard granulation

j. Store processed honey awaiting sale in a cool place at a temperature below 50° F.

3. Taking the honey crop from the hive

a. Two methods of supering

(1) Top supering - place an empty super atop the last super

(2) Exchange supering - place an empty super below the full super

b. Removing the honey using the exchange super method

(1) Place the super to be filled beneath the super to be removed

(2) Install the inner cover with a bee escape on top of the empty super

(3) Insure that the bee escape is mounted such that the bees which exit the full super cannot enter it again

(4) Remove the full super twenty-four hours after the bee escape was installed

(5) Take the full super to the honey house for processing

c. Removing the honey using the undersupering method as shown in Fig. 1.

(1) Use undersupering method with top supering

(2) Place supers on the hive as illustrated in Figure 1.

4. Removing honey from the super

a. Hobbyist

(1) Use long-bladed knife.

(2) Heat the knife by dipping into boiling water

(3) Use the knife to cut around the edges of the frame or section

(4) Use the hot knife to uncap the honey

(5) Uncap honey over a container to catch the dripping honey and to avoid waste of the valuable food

b. Commercial producer

(1) Uses steam as a source of heat

(2) Uses an electrical heater

(3) Uses a mechanical operation

5. Extracting honey from comb (one of the simplest ways of producing honey)

a. The hobbyist may use the honey which is extracted from the comb at the time of removing from the hive to fill containers or packages of comb honey which are sold, or the extracted honey may be purchased in bulk for this purpose.

b. The hobbyist should avoid extracting honey for sale.

c. The hobbyist may extract honey in the following manner if he so desires:

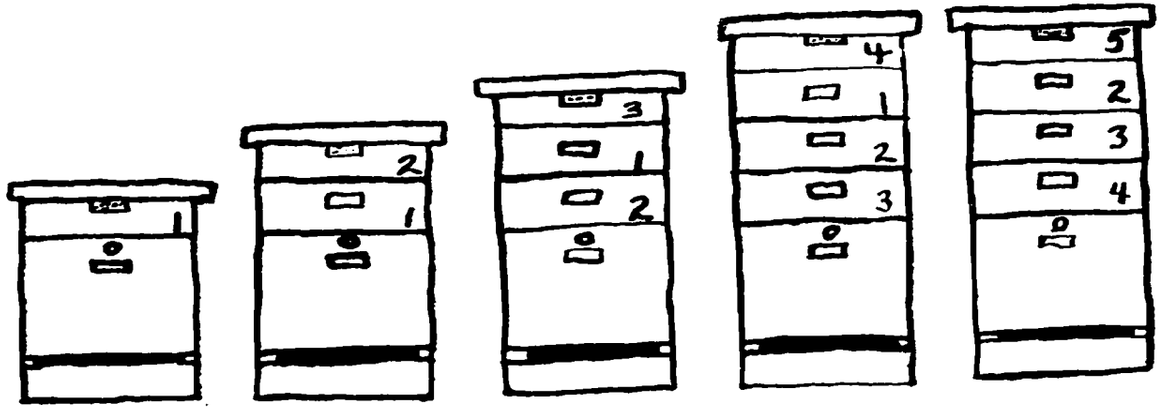

Figure 1

(1) Crush comb and strain the honey through double-thickness cheesecloth

(2) Uncap the comb honey with a hot knife and allow honey to drain from comb through the straining cloth.

(3) Use a double boiler

(a) Heat comb honey until wax melts

(b) Allow honey to cool and wax to rise to the surface

(c) Allow wax to harden and remove from the honey

d. The commercial operation for extracting honey:

(1) Use a hot knife to remove cappings

(2) Place the uncapped honey in the extractor

(3) Operate the extractor to remove honey from comb by centrifugal force

(4) Remove the comb from the extractor

(5) Strain the honey from the extractor into a settling tank. Fill containers from settling tank.

C. Processing honey

1. Pasteurization of bulk honey for storage

a. Heat honey in a double boiler to 160° F. Do not exceed 30 minutes at this temperature.

2. Making "creamed honey," or "whipped honey."

(a) add fine-grain crystallized honey to the pasteurized honey after it has cooled to start granulation.

(b) Store at 57° F.

3. Liquefying granulated honey

a. Heat in a double boiler

b. Heat to a temperature not higher 160° F.

c. Cool quickly

4. Packaging honey

a. The producer may pack honey for sale in glass, plastic, or paper containers lined with plastic

b. The producer may sell bulk, chunk, cut, section, or

extracted honey.

D. Producing beeswax

1. Beeswax cappings, taken off before the liquid honey has been removed, are drained and melted. Product is called capping wax.

2. Culled combs should be melted and pressed under hot water to make cakes of beeswax.

3. Comb is sold as beeswax in cases where it is not needed for further honey production or may be bartered for new wax foundation or other bee supplies.

4. Beeswax may be delivered to many of the bee supply companies for sale or in trade for wax foundation or other bee supplies.

5. Uses of beeswax.

a. Ingredient in cosmetic industry.
b. Pigmented and applied to paper, called carbon paper.
c. To seal the ends of shotgun shells.
d. To seal the bullets in the casings of cartridges
e. To serve as the base for furniture polish.
f. To make candles.
g. To coat thread used in making shoes.

E. Marketing honey

1. Marketing quality honey

a. Honey must be well-flavored, produced from a desirable honey-type nectar.

b. Honey must have an appropriate moisture content to prevent fermentation.

c. Honey must be clean of all foreign particles.

d. Honey must be packaged in clean, attractive, and properly labeled containers.

2. Advertising honey

a. Sell only high quality honey

b. Package honey in neat, clean containers

c. Label packages in an attractive manner

d. Pack same grade of honey in one container

e. Display attractive, eye-catching samples

f. Deal honestly with customers

g. Establish a set price for types and grades of honey

(1) Indicate predominant floral source on the label.

(2) Assign price by floral source and quality of honey

3. Locating markets

a. Ask family friends if they would like to buy honey

b. Set up a roadside stand

c. Ask super market managers or owners to display honey products for sale

d. Advertise on public service radio program

e. Sell honey to organic food stores

f. Exhibit honey at local fairs

4. Selling honey

a. Sell honey on a cash basis only when starting the business

b. Establish regular customers for the honey where possible--Remember, a repeat customer is an indicator of customer satisfaction with the product and is the best advertisement for a business!

PROJECT SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

NAME OF PROJECT - Project 1

Observing an experienced beekeeper preparing to market honey.

MATERIALS

Pen, pencil, tape recorder, camera

PROCEDURE

1. Review procedures for labeling and marketing honey, section E-1 of Unit 9.

2. Prepare for your visit in advance. Make sure your visit to the beekeeper fits into his schedule.

3. Talk to the beekeeper. Ask questions and keep notes concerning:

   1.) Where he sells his honey

   2.) Containers

   3.) Labels

   4.) Financial agreements with customers

   5.) Prices

   6.) How he goes about packaging his honey

   7.) Suggestions which he has for the student as a beginning beekeeper

PROJECT SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

NAME OF PROJECT - Project 2

Packaging, labeling and marketing honey

MATERIALS

Containers, labels, and other equipment as indicated in Lesson IX

PROCEDURES

1. Review procedures for packaging, labeling, and marketing
2. Package the honey which has been produced
3. Label the honey
4. Market the honey

PROJECT SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

NAME OF PROJECT - Project 3

Liquefying granulated honey

MATERIALS

Heat source (stove), double boiler, fine-grain honey

PROCEDURE

1. Heat granulated honey in a double-boiler to temperature of not more than 160° F.
2. Cool quickly
3. Seed with fine-grain honey to reduce the granulation rate of the honey

GLOSSARY IX

PRODUCING, HARVESTING, AND MARKETING HONEY

Advertising - action taken to attract public attention to a product to arouse the desire to buy that product.

Centrifugal force - a rotational force which propels honey to be thrown from the comb to an outward direction.

Chunk comb honey - a means of packing honey in which a piece of honeycomb is placed in a container of liquid honey, or wrapped, as taken from the super, in a plastic container.

Comb honey - edible comb which has all cells filled with honey and sealed with beeswax.

Cut comb honey - comb honey which has been cut into the appropriate sizes and packaged in plastic.

Crystallize - the action of the sugar in honey to become a solid.

Dextrose - a natural sugar found in honey.

Double boiler - a cooking utensil consisting of two saucepans fitting into each other so that the contents of the upper can be cocked by boiling water in the lower. (A larger type of double boiler is used in a commercial operation).

Fermentation - the reaction of yeast and sugars in honey associated with a high moisture content in the honey.

Granulation - solids forming in honey which depend upon the water content of the honey and the ratio of dextrose to lexulose.

Lexulose - a natural sugar found in honey.

REFERENCES FOR LESSON IX

PRODUCING, HARVESTING, AND MARKETING HONEY

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2. U. S. Department of Agriculture. Agricultural Stabilization and Conservation Service Regulation for Loan Program for Honey Price Support Program with amendments, dated April 8, 1970.

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6. U. S. Department of Agriculture. Permanent Glass Color Standards for Extracted Honey. Eastern Regional Research Laboratory, Philadelphia, Pennsylvania, May, 1951.

7. White, Jonathan W., Jr. Coarse Granulation of Honey. Eastern Regional Research Laboratory, Reproduced from Gleanings in Bee Culture, Philadelphia, Pennsylvania.

8. Beekeeping in Virginia, Bulletin 178, Virginia Polytechnic Institute, Blacksburg, Virginia, Revised 1965.

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QUIZ IX

PRODUCING, HARVESTING, AND MARKETING HONEY

Circle the best answer:

1. What is the maximum moisture content which honey being stored in normal conditions may have before spoilage occurs as a result of water in honey?

   a. 16.5% b. 12% c. 8% d. 14% e. 18.5%

2. When processing honey to retard granulation or to dissolve crystals, the honey should not be heated above:

   a. 121° F. b. 160° F. c. 98.6° F. d. 120° F. e. 140° F.

3. What is the simplest type of honey to produce?

   a. light amber b. extracted c. cut d. chunk

4. The best advertisement for a hobbyist's honey sales operation is:

   a. repeat customers b. attractively labelled packages

   c. dirty containers d. poor quality honey

ANSWER SHEET IX

PRODUCING, HARVESTING, AND MARKETING HONEY

ACTIVITY SHEET IX, Section II-B:

1. List five plants which grow near the school from which the honey bee gathers nectar to make high quality honey.

   a. alfalfa
   b. black locust
   c. sour wood
   d. soybean
   e. sweet clover

2. What are the grades of table honey?

   The grades of table honey are:

   1. White and lighter honey
   2. Extra light amber
   3. Light amber
   4. Other table honey

3. What are three factors which reduce the quality of honey?

   a. undesirable type plant from which nectar was collected
   b. moisture content of honey
   c. unfavorable temperature for storage of honey
   d. excessive heat

4. Outline the porcess to follow when restoring honey to its original condition once it has crystallized.

   Liquefying granulated honey:

   a. heat the honey in a double-boiler
   b. heat the honey to a temperature <u>not</u> higher than 160° F.
   c. cool the honey quickly
   d. place in dry heat until all crystals are dissolved

QUIZ IX

1. e - moisture content above 18.5% increases the rate at which honey will ferment.

2. b - temperature above 160° F. decreases the quality of honey.

3. b - extracted honey is the simplest to produce. The combs may be sacrificed if extracting equipment is not accessable.

4. a - repeat customers are the best advertisement for a business.

ACTIVITY SHEET X

LAWS AND REGULATIONS

OBJECTIVES

I. At the end of this lesson the student should:

   A. Have conformed his beekeeping business or practice in compliance with Apiary Laws.

   B. Have observed an official inspection of his Apiary.

   C. Have the opportunity to correct shortcomings in his apiary which are noted by the inspector at the time of the inspection.

II. At the end of this lesson, the student should be familiar with the price support program for honey by having completed the following:

   A. Visited the county office of the Agricultural Stabilization and Conservation Service (ASCS).

   B. Read the Loan Program for Honey, ASCS Document, with appropriate amendments.

   C. Completed a sample form for application for the Honey Price Support Program.

III. At the end of this lesson, the student should have produced honey for home usage or sale through the price support program or for sale to customers.

PROCEDURES

I. Study Information Sheet X. If the student has difficulty with this lesson, he should ask the teacher for help.

II. View the film, "Why We Respect the Law," (color, 13 min.), 1950 from Educational Motion Pictures for Virginia's Public Schools.

III. Answer the following questions:

   1. Why is it important for each beekeeper to comply with the Apiary Laws?

   2. How would a beekeeper who wanted to ship bees out of this state obtain a certificate to show the disease-free status of the bees?

   3. As a beekeeper, if you desired to borrow money from the ASCS to improve your apiary and to increase the amount of honey being produced, what would you do?

INFORMATION SHEET X

LAWS AND REGULATIONS

I. Federal Laws and Regulations which Apply to Beekeeping:

A. What is a law?

A written custom or practice of a community or society which specifies the conduct of citizens or is enforceable upon the citizens.

B. What is a regulation:

A regulation is a set procedure which is established under the enabling provisions of a law to control an organization or the actions or an organization or industry.

C. What are the important Apicultural Laws?

1. Importing bees into the United States:

a. Honey bee Act of August 31, 1922

(1) Restricts shipping of live, adult honeybees into the United States.

(2) Amended in 1947 and 1962.

b. Public Law 87-539

(1) Honey bee Act with latest amendment.

(2) Law prohibits importing of adult bees into the United States.

(3) Exceptions to the law:

a. Disease-free honey bees may be shipped into the United States from Canada.

b. Adult bees may not be shipped into the United States from any country other than Canada.

c. USDA Agricultural Research Service may import immature honey bees from any country for experimental or scientific purposes.

2. Shipping bees - Interstate Laws

a. Purpose:

(1) To prevent the spread of disease.

(2) To enable inspectors to inspect all colonies and to deal with diseased colonies which make up a reservoir of disease.

(3) To regulate movement and entry of honey bees from one state to another.

(4) To control the issue of permits and certificates and apiary locations.

b. Requirements by Virginia for interstate movements of bees and used beekeeping equipment:

1. Bees on comb and used equipment:

a. Permit is required.
b. Certificate is required to show that bees are disease-free.
c. Certificate is to accompany the shipment of bees to indicate disease-free status.

2. Package bees - certificate is required for the shipment of queen bees.

3. Queen bees - certificate is required for the shipment of queen bees.

3. Shipping of bees - Intrastate laws and regulations:

a. Inspection required.

b. Inspection of apiaries required.

c. Inspection of honey house required.

d. Entry right of inspector required.

e. Inspection of movable frame hives required.

f. Quarantine of diseased apiaries permitted.

g. Notification of owner upon finding a disease by the inspector is required.

h. Destruction or sterilization of American Foulbrood disease is required.

i. Disinfection of person, clothing, and appliances by inspector is required.

j. Penalties in Virginia for violating intrastate laws:

1. Fine

2. Jail Sentence

k. Sale or transfer of diseased material is prohibited.

l. Drug treatment under the direction of the state apiarist may be permitted in curing some diseases of honeybees in Virginia.

II. Honey Price Support Legislation -Agricultural Act of 1949:

A. Designated non-basic agricultural commodities be supported at 60-90% parity (fair market value).

1. Parity - a measure of price levels needed to give agricultural commodities a purchasing power sufficient to cover the cost of their production, equivalent to the purchasing power of those agricultural commodities in a base period.

2. Factors in determining parity for honey sold to Community Credit Corporation (CCC).

a. Supply versus demand - if supply is larger, price is generally lower, and if supply is small the price is generally higher.

b. Price levels at which other commodities are being supported.

c. Availability of federal funds.

d. Perishability of honey.

e. Importance of honey to agriculture and the national economy.

f. Ability of the government to sell honey acquired through price support operations.

g. Need for offsetting temporary losses of export markets.

h. Ability and willingness of producers to keep supply in line with demand.

B. Factors which lead to price support of honey:

1. Sugar rationing during World War II.

2. Government requested increased production of honey in World War II.

3. Price of honey dropped when sugar ration removed.

4. Producers of honey faced economic depression after World War II.

III. Federal Price Support Program

A. Honey price is supported by loan or purchase program.

1. Loan

a. Price support rate on farm-stored honey for any or all honey produced.

b. Beekeeper receives cash to use and to enable the beekeeper to store honey until he finds a more favorable market.

c. Beekeeper pays off the loan by delivering honey in value equal to the value of the loan at the end of the year in cases where market prices do not rise above the support price.

2. Purchase

a. Used when honey is not collateral for a loan.

b. Sell any or all honey, not loan collateral, at applicable support price to the Commodity Credit Corporation.

c. Obtain monies for loan or from purchase of honey at the county ASCS office.

B. Costs to operate price support program:

1. Beekeeper pays a $4 loan dispursement fee to obtain a loan.

2. Beekeeper pays 1¢ for each hundred pounds of honey for an inspection fee and for certification of grade.

3. Beekeeper pays insurance, storage, and handling on shipment of honey.

C. Standards of quality for honey:

1. Quality is determined by comparing a shipment of honey to standards for grades of extracted honey.

2. Standard color classes are:

a. Table honey

(1) White and lighter

(2) Extra light amber

(3) Light amber

(4) Other table honey*

b. Nontable honey

3. Area of the United States in which the honey is produced-there are different parity support prices for the Eastern and Western areas of the country.

*These color grades may vary. The grades are based more on floral source predominance and proper handling, which means clean and unheated honey.

PROJECT SHEET X

LAWS AND REGULATIONS

NAME OF PROJECT - Project 1.

Visiting the local courthouse for career opportunities and educational benefits.

MATERIALS

Pencil and notebook.

PROCEDURES

From the student's observation of a trial and the courthouse visit, determine how laws are implemented.

What are the duties of the judge, the clerk of the court, and the marshal?

How does one find the laws pertaining to a specific case or to a given situation?

PROJECT SHEET X

LAWS AND REGULATIONS

NAME OF PROJECT - Project 2

Visiting the county agent and the local Agricultural Stabilization and Conservation Service Offices

MATERIALS

Pencil and notebook

PROCEDURE

1. Discuss with the county agent the recommended pesticides for use on crops which require pollination by honey bees and the effects of the pesticide on honey bees.

2. Discuss with the county executive director for the ASCS program the procedures for signing up for the Price Support Program for honey to include:

   A. What is the estimated support payment for one-hundred pounds of honey sold

   B. How are support prices determined

   C. How are the grades for honey determined

PROJECT SHEET X

LAWS AND REGULATIONS

NAME OF PROJECT - Project 3

Visiting the delivery site when the Commodity Credit Corporation collects honey

MATERIALS

Pencil and notepad, camera with slide film, and flash attachment

PROCEDURE

1. Locate the CCC and/or ASCS representatives and introduce yourself and explain that you would like to observe and to take pictures of the honey collecting and grading processes.

2. Use the slides to make a presentation to your class members of your observations and experiences.

3. Meet with the county executive director for Agricultural Stabilization and Conservation Service.

4. Attend a trial at the local courthouse and visit with personnel who work in the courthouse

5. How is knowledge of the laws important to the beekeeper?

6. What action should a beekeeper take if he suspected that American Foulbrood disease had infected his colonies?

PROJECT SHEET X

LAWS AND REGULATIONS

NAME OF-PROJECT - Project 4

Duties of the State Apiarist

MATERIAL

Pencil and notebook, camera with film and flash attachment

PROCEDURE

1. Find out who is the State Apiarist
2. Contact him to arrange a meeting either personal interview, or invite him to speak at an FFA meeting
3. Let the Apiarist speak about his duties and his experiences
4. Record the duties, and office address of the State Apiarist for your use after you become an established beekeeper
5. Determine the role of honesty and good business relations when dealing with the State Apiarist and Apiary Inspectors.

NOTE: Retain this completed unit for future usage.

GLOSSARY X

LAWS AND REGULATIONS

Collateral - material offered in good faith to secure the performance of an obligation.

Law - a written custom or practice of a community or society which specifies the conduct of citizens or is enforceable upon the citizens.

Parity - a measure of price level to give agricultural products an equivalent purchasing power with respect to its cost of production.

Permit - a written license granted by the State Apiarist to ship bees and equipment within or into Virginia.

Regulation - an authoritarian, prescribed procedure to control the actions of an organization.

Quarantine - a restraint placed upon the beekeeper to restrict his activities with bees and to prevent movement of bees and equipment in an effort to control the spread of disease.

REFERENCES FOR LESSON X

LAWS AND REGULATIONS

Beekeeping in Virginia, Publication 372. Blacksburg, Va.: Virginia Polytechnic Institute and State University, January 1970.

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Legal Principles for Farm Managers - A Teacher's Unit Plan, Teacher Education Series, Vol. 9, No. 5-t, University Park, PA.: The Pennsylvania State University, 1968.

Virginia Apiary Law as amended 1972. Charlottesville, VA.: Virginia Department of Agriculture and Commerce, 1972.

QUIZ X

LAWS AND REGULATIONS

Multiple Choice (Select one answer)

1. When a beekeeper ships package bees from Virginia to New York for sale to a customer, the beekeeper has to:

   a. have the State Apiarist inspect his honey house before he can sell the bees.

   b. ship the bees in a movable frame hive.

   c. obtain an inspection of the bees and a certificate from the state inspector before shipping the bees.

   d. file a report of the Apiarist's inspection with the State Entomologist before shipping the bees.

2. The limitation of a certificate in days allowed for shipping the queen bee after an inspection for certification is _____.

   a. 15 days b. 30 days c. 45 days d. 60 days

3. The Virginia State Law which regulated interstate travel of honeybees was:

   a. Honey bee Act of August 31, 1922

   b. The Virginia Apiary Act of 1938

   c. The Virginia Apiary Act of 1972

   d. Public Law 87-539, amended in 1962.

4. The duty of the beekeeper is to:

   a. provide immovable frames in all hives used by the beekeeper to contain bees.

   b. cause the colony to construct brood comb in supers.

   c. close the entrance of any hive in apiaries not free from disease.

   d. allow the other colonies of bees to remove the honey from diseased colonies.

ANSWER SHEET X

LAWS AND REGULATIONS

ACTIVITY SHEET X, Section III:

1. Why is it important for each beekeeper to comply with the Interstate Apiary Laws?

   The laws exist to prevent the spread of disease and to protect the beekeeprs's business from disease. The laws allow the apiary inspectors to regulate the movement and entry of honey bees into and out of Virginia to control the issue of shipping permits and certificates, and to enable inspectors to quarantine, to inspect, and to treat diseased colonies.

2. How would a beekeeper who wanted to ship bees out of this state obtain a certificate to show the disease free status of the bees?

   A. Steps to follow to obtain a certificate:

      (1) Write a letter to the State Apiarist

      (2) Request an inspection of the apiary and the bees to be shipped

      (3) Give the date in the letter when the bees are to be shipped

      (4) State the location to which the bees will be shipped

      (5) Include the business or home telephone number

   B. Inspector will give the certificate to the beekeeper after the inspection if the bees are free of disease

   C. As a beekeeper if you desired to borrow money from the ASCS to improve your apiary and to increase the amount of honey being produced, what would you do?

      (1) Visit the county ASCS office

      (2) Discuss your situation with the county executive director for Agricultural Stabilization and Conservation Service

      (3) Determine the current parity price for honey for your location

      (4) Determine the amount of honey which you will produce which may be used as collateral for the loan

      (5) Determine if a loan from the ASCS is to your advantage

(6) Apply for the loan program

QUIZ X

1. c - bees whether shipped in package as a colony, or as queen bee, or transporting an entire colony over county or state lines must be inspected and certified disease free. To move bees within the state, the colony must be inspected at least annually. To ship bees out of Virginia, the bees must be inspected and certified disease free within the past sixty days.

2. d - 60 days is the time limit on certificates issued by the State Apiarist.

3. b - The Virginia Apiary Act of 1938 is the basic document which regulates the beekeeping industry in this state.

4. c - The beekeeper has the duty to prevent the spread of disease and closing the entrance of the hive with the diseased bees inside the hive is the best temporary means to control the spread of disease.

The hive is made "bee-tight" until provisions can be made for destroying or sterilizing the contaminated hive.