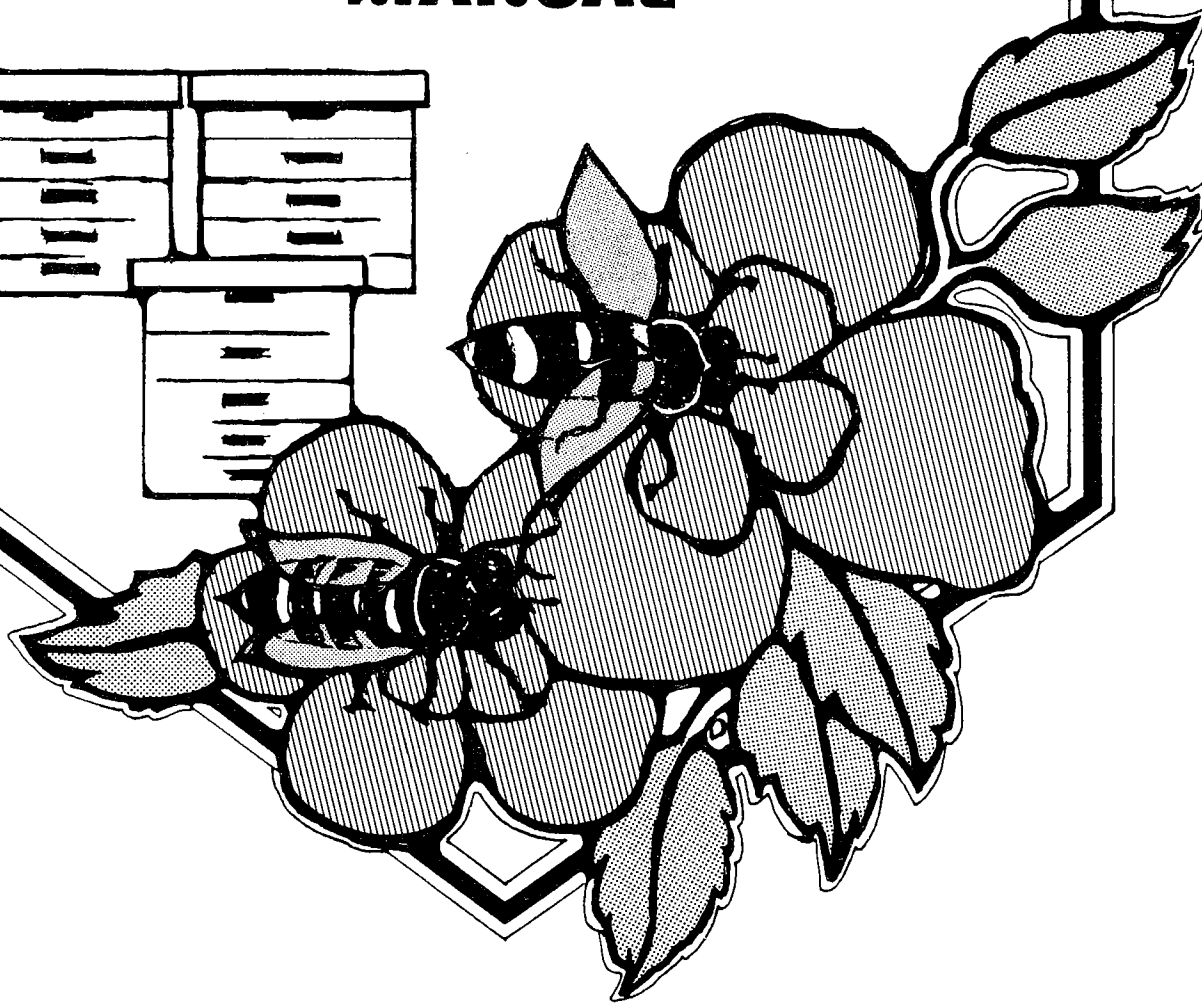
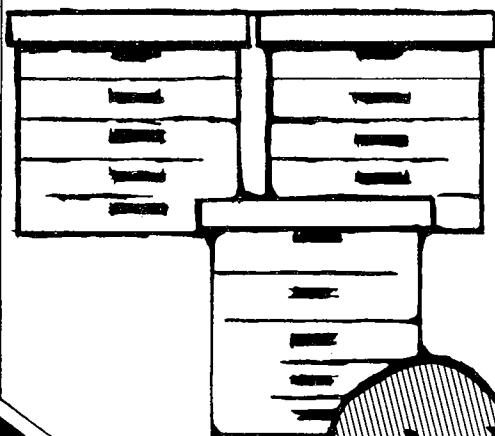




4-H ADVANCED BEEKEEPING MANUAL



NAME _____ AGE _____

ADDRESS _____

CLUB NAME _____ LEADERS NAME _____

4-H Advanced Beekeeping Manual

By

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ADVANCED BEEKEEPING PRE-TEST

1. What is the significance of the number twenty-one (21) to beekeepers?
2. What is division of labor in a honey bee colony based on?
3. What do worker honey bees use to make food for the developing larvae?
4. What is bee botany?
5. How can the beekeeper stimulate his colony of honey bees?
6. List five requirements honey bees need to help them survive the winter:
7. What important nectar- and pollen-producing plants occur near your bee yard?
8. Why does the most important inspection of a honey bee colony occur in the spring time?
9. What is swarming? How can it be prevented?
10. Name two different types of honey a beekeeper might produce:

A 4-H ADVANCED BEEKEEPING MANUAL

Remember Sergeant Joe Friday? He was the taciturn Los Angeles policeman played by Jack Webb in the television program, Dragnet. His monotonous line was, "all we want are the facts". Once he got the facts, Sergeant Friday usually solved the crime.

In the basic 4-H beekeeping manual, you were provided with a lot of facts about bees and beekeeping. You'll get some more here. Mostly though, this booklet will deal with concepts. Beekeeping concepts are harder to fully understand than bee facts. In order to use the concepts wisely, you will have to think a little more and use information you learned in basic beekeeping, as well as your experiences manipulating bee colonies. Knowing about the concepts of beekeeping, though, will make you a much better beekeeper.

When finished with this booklet, you should be able to:

1. Tell the importance of the number twenty-one (21) to the beekeeper.
2. List the pollen- and nectar-producing plants in your area and the time they bloom.
3. Add supers
4. Prevent swarming
5. Prepare a colony for winter
6. Tell how division of labor works in a honey bee colony.

CONCEPTS: BASED ON FACTS

To see how concepts are developed from a knowledge of facts, let's find out some more about entomology. You already know entomology is the study of insects which have six legs and three body parts, and that they are cold-blooded creatures. But why is the biggest insect in the world less than a foot long? There are several possible answers. One might be because of their hard outer skeleton. As body size increases, so does weight. So, if insects got too big, their outer skeleton couldn't support the weight, and they'd collapse. Insects breathe directly through the skeleton, and each tiny cell in an insect's body must be provided with a small tube called a tracheole (branches of bigger tubes called trachea) to bring in air. It's possible for an insect to get so big that a point would be reached where this kind of breathing system wouldn't function. Really, we don't know exactly why insects don't get any bigger, but knowledge about size, weight and respiration in insects help us explain why most of them are small.

Insect Body Size:

1. Limited by weight because of exoskeleton
 2. Limited by tracheal breathing system
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How do concepts built on facts help a beekeeper? Why is it important, for example, for beekeepers to know about the twenty-one day development cycle of the worker honey bee? It's not because the writer of this book thought, "this is important", but because it designates the time limit a bee colony can develop a generation of bees in--something every good beekeeper always takes into consideration if he wants a good honey crop.

Here are some other concepts to be discussed in this booklet:

1. The growth of bee population based on pollen and nectar production by separate plants and at different times.
2. The swarming instinct and how it is prevented.
3. The supering of the hive, when and why.
4. The how and why of wintering honey bees.
5. The significance of the beekeeper's calendar.

First, though, a few more facts. Worker honey bees are the most numerous kind in a hive. Do you remember how many there usually are? And it's this population of worker bees that's responsible for gathering the nectar which determines the size of the beekeeper's honey crop. But not all workers forage.

DIVISION OF LABOR: MORE PRODUCTION PER WORKER

Are you familiar with Henry Ford? Although most people know him for his automobiles, he is much more recognized for developing the concept (There's that word again!) of the assembly line. He believed the best way to provide everyone with an automobile was to build them with specialized labor, where each person does one job well and quickly. If you visit a modern automobile plant, you're liable to see one person on the line put in place five bolts which another person will fasten with a wrench. This is the concept of division of labor. And each day we know the value of the assembly line and its division of labor. Most people either own or have access to an automobile because of it.

BEE DIVISION OF LABOR: DEPENDENT OF AGE

Honey bees never heard of Henry Ford. It doesn't make much difference though, because bees developed the idea of the assembly line using specialized labor way before Mr. Ford's time. Each worker bee has a specialized job in a colony. Usually, this is based on the age of the bee, but not always. Young bees are born or emerge from their cell (in how many days from being laid as an egg?) to begin life in the colony by doing housework--cleaning the six-sided cells of the comb.

Jobs of Worker Bees

Days	
1-2	cleaning cells
3,4,5	feeding older larvae
6,7	feeding younger larvae
6-10	processing nectar
14-16	secreting wax
16-20	constructing cells
20	orientation flying
20-40	foraging for nectar and pollen

Within a day or two, however, they graduate to nurse bees. They don't get a diploma, rather their body changes. Glands in the head begin to swell, allowing the bee to produce a large amount of white, milky substance called jelly or brood food. The brood food provides a lot of protein for the developing larvae. Do you remember the source of the bees' protein? The young bees eat pollen which is broken down by their bodies. The proteins from the pollen are then incorporated by the head glands into brood food.

As the brood food glands develop, the young bees begin to feed older larvae (those over three days old). We can only guess why this is true. Perhaps they don't have the experience yet to feed the younger, extremely delicate and fragile larvae? It is only later (4 to 6 days from emergence) they begin to feed younger larvae.

Also, about that time (6 to 10 days from emergence), the young bees graduate from being nurses to processing honey. They receive the watery nectar from foraging bees and begin the process of chemical change and water removal which finally turns this sweet solution from flowers into honey. The young bees may also branch out and do other duties at this time, like fanning to cool the hive or guarding the entrance from intruders.

The brood food glands then slowly begin to become reduced in size, for the bees no longer need to feed the larvae. That job is taken over by younger bees. Around 16 to 20 days from emergence, other glands develop and, if times are good, wax begins to be manufactured by the bee's body. The young wax-makers then hang together between the combs while the wax flows out of their bodies and hardens into delicate flakes or scales. These wax scales are then removed by the wax-maker and passed up the line to construction bees which put them in place, chewing and shaping them into cells of the honey comb. If remove a comb (when a lot of nectar is being brought into a colony) you may see long strands of wax-makers hanging onto each other by their legs.

By the time a worker bee reaches 20 days of age from emergence, she's usually had a varied life inside the hive. Now, though, she graduates, leaves the colony and begins orientation flights which will end in her becoming a forager bee. Orientation flights are sometimes called "play flights" by beekeepers. You're likely to see these on warm spring and summer mornings when a cloud of bees will exit the hive and hover in the air near the entrance, each bee flying in ever increasing circles farther and farther from the colony.

BEE MANAGEMENT BY THE BEEKEEPER

What does all the above mean to a beekeeper? It depends. If a beekeeper is rearing queens, he knows young bees are the only ones that can make enough food necessary to produce the well-fed larvae from which quality queens will develop, and he adjusts his beekeeping to get a large supply of young bees. A honey producer, on the other hand, is more interested in adult bees old enough to forage for nectar. Young bees will always be necessary he knows, but a majority of older workers out in the field when the blooms are producing nectar is what really counts to make a fine honey crop. So the honey producer may stimulate his bees by early feeding hoping to have a larger field force when plant nectar production begins.

BEE BOTANY

When we talk about bees, it's difficult not to talk about plants. Not all plants, but those few that are so important to honey bees. Have you heard of willow honey? Few persons have. When do willows bloom? Early spring is the time bees need a lot of pollen and nature has provided in her scheme of things plants blooming at that time that do produce much pollen. The willow is one. Can you name some other plants blooming this time of year that also produce pollen for bees? How about red maple?

Soon, though, pollen will not be in such great demand by the bees as their population begins to peak. Later, when there's a maximum population of foraging bees, other plants bloom which mostly produce nectar and the protein necessity of brood rearing is reduced. Citrus, blackberry, crimson clover, saw palmeto, tupelo and gallberry are just a few examples.

Usually a definite decline in bee population is observed during mid to late summer. Can you explain why? Fewer nectar- and pollen-producing plants bloom this time of year. Soon, however, in some areas, the population again begins to expand in response to flowers like goldenrod, smartweed, aster, melaleuca and summer farewell which produce nectar in the early fall. All this seems straightforward. Unfortunately, there's never any certainty about how and/or when nectar will be produced. Soil types, rainfall, and other local weather conditions as well as many other factors may combine to make one year poor and the next year good.

That doesn't mean to say there isn't a pattern to all this. There is--usually an orderly increase and decrease of the bee population through the year stimulated by the presence or absence of pollen and nectar-producing plants. It's up to the beekeeper to help the bees during times when this rhythm is interrupted. Rain, for example, can literally wash away nectar, or an early cold spell can cut short a valuable source of food before the bees have a chance to store it in their combs.

The beekeeper also has the ability to stimulate the bee colony. He can, and many do, feed the bees sugar syrup in anticipation of the nectar to come. That way a bigger population of foraging bees will be available at the time most of the nectar is being produced. Should he do this, however, the beekeeper then must be prepared to continue to feed the insects to keep them alive if the nectar for some reason isn't produced.

Let's now look at a visual summary of all these events. Attached is a beekeeper's calendar for a full year. Notice how the population of adult honey bees goes up and down. Compare this population rise and fall with the number of plants blooming at the usual time. Bloom time is shown in the middle of the page by solid black lines. Dotted black lines show possible blooming time. Are there any kinds of comparisons you can make? Generally, the population and bloom time operate as shown, but not always. The timing may be off anywhere from one to three weeks based on weather conditions and other factors. Maple, for example, usually blooms from mid January to mid February. But it can begin earlier or later.

Finally, the third portion of the calendar shows the possible manipulations by the beekeeper. Again these manipulations must be done depending on prevailing conditions.

Now, let's go through a beekeeping year while looking at the calendar. We will start with September. Why not January? Because the beekeeping year usually begins in autumn when the bees are put away for winter.

WINTERING

You already know insects are cold-blooded. So how do these creatures pass the winter? Most overwintering insects do so alone, sort of hibernating like bears. The honey bee is different, however, and because of its complex society, can overwinter as a colony. Basically, the bees ball up when the temperature drops. They create heat in this ball or cluster by flexing their flight muscles--much like our muscles create heat when we shiver. A layer of bees on the outside of the ball confines the heat produced within the ball.

Requirements for Winter

1. Necessary supplies
 2. Adequate population
 3. Good Queens
 4. Hive protection
 5. Ventilation
-

The bees are fine in this cluster all winter and will not freeze. In most of Florida, of course, it never gets that cold. But that's only if they have enough honey to eat to produce heat. This leads to one of the most important beekeeping rules: leave the bees plenty of honey for winter--most bees that die over winter don't freeze to death, they starve to death. Basically each colony should have: (1) necessary supplies of pollen and nectar; (2) adequate population size; (3) good queens; (4) hive protection; and (5) ventilation.

The usual rule is to provide a colony with 50 to 80 pounds of honey, three to four frames of pollen, a basketball-sized cluster of worker bees covering about seven frames, brood on five to six frames, a prolific queen, a north and/or northwest protective barrier such as a fence, hill or line of trees, and good upward ventilation provided by lifting the hive covers onequarter inch or so, or boring three quarter-inch holes in the brood chambers above the hand holds.

Even with all the necessary precautions taken in fall, a colony can die during winter. The winter may be warmer or colder than normal causing food consumption to increase and/or the bees to suffer more than usual, respectively. So it is important to take time to inspect the colony once-in-awhile during winter to see how the bees are progressing. On a warm day, you can open the colony to estimate its strength in bees and food. Some beekeepers simply gauge the weight of each hive by lifting it off the ground. Because bees are cold-blooded, the ball or cluster should never be disturbed at temperatures below fifty degrees!

Your most important inspection will be in spring (January-March). That's when the bees begin to produce brood. With brood production, the food supply is rapidly eaten. Remember the extreme food needs of a single larva which grows over 1,000 times its original size in just a few short days. If the weather is colder than normal and the first few flowers of spring don't appear on time, the bees could starve to death very easily. That's when you, the beekeeper, can come to their rescue by feeding sugar water, candy or even dry sugar in an emergency.

Notice on the calendar the first inspections are called for in January and February. Maples and willows are blooming at this time. Remember, they produce the pollen so necessary for young bees to develop. Adult bee population is also growing rapidly in March. That way many workers will be available to take advantage of citrus, blackberry, palmetto, gallberry and tupelo (west).

Supers are also added to provide more storage space for nectar which the bees will make honey from. Supers also give more room for the expanded bee population. This is important. If you have five brothers and sisters and live in a two bedroom house along with them and your parents, most likely the whole family will feed crowded. As a consequence, your parents may be looking for another larger house to put the family in. For the bees, it's the same. If they feel crowded--perhaps the beekeeper hasn't added any supers--they will make preparations to move.

SWARMING

Unlike your family, the whole bee colony will not move. Instead, the bees produce a new queen and then the old queen plus about half the workers and drones will leave all at once. This is called swarming, and the bees leaving the hive are called collectively, a swarm.

Many people in spring see a large clump of bees appear as if by magic on a nearby limb or on the house next door. This swarm frightens them because they've never seen so many bees at one time. Swarming bees, though, are the least likely to sting. Have you ever been run off by a dog or seen one dog chase another? You may have noticed that as a dog leaves its yard to chase another, it becomes less committed the farther it gets away from home. The same is true for bees. With no home to defend, they usually are not in a stinging mood.

To see a swarm emerge from a hive on a warm morning is marvelously exciting, but beekeepers try everything possible to keep swarming from happening. That's because the bees leaving the hive are full of honey. When people move, large trucks filled with their belongings accompany them. The bees don't have any trucks, but they take as much with them in their honey stomachs as they can. To make matters worse for the beekeeper, the population left behind is fewer in number and less able to gather nectar to make a honey crop. This means that in many instances of swarming, a beekeeper's honey crop is seriously depleted or perhaps eliminated altogether.

Swarming cannot be eliminated in all bee colonies, just as giving birth cannot be totally controlled in human society. The urge to reproduce the species is extremely strong in all forms of life. The good

