

A WASTED SUGAR SUPPLY.

By E. F. PHILLIPS,

Apiculturist, Bureau of Entomology.

THE AMOUNT of nectar secreted by the multitude of flowers from coast to coast is large beyond our comprehension. Secreted to the end of attracting insect visitors in order that cross-pollination may be effected, this nectar is poured out freely by hundreds of species. The percentage of sugar in nectar varies with different plant species and also with climatic differences, but it is well within the bounds of truth to state that the total sugar thus secreted far exceeds the amount of all sugars consumed by the American people now obtained from cane and sugar beets.

Unfortunately this nectar soon disappears as the flowers wither and is lost to human use. Any method of conserving this abundant resource must be through an agency which is ever on the alert for each fresh supply. Individuals of a multitude of insect species seek out this nectar for their food, and as many of these insects are economically valuable, the nectar they consume is turned to a useful purpose when viewed from the standpoint of human economy. Of all these nectar-seeking species, however, the honeybee alone is capable of being used by man as an instrument for collecting this sugar supply, and even this useful species can scarcely be considered as an example of brilliant efficiency when viewed solely from man's selfish point of view. It is the object of this article to show that beekeeping may be increased so as profitably and economically to help us save more of this now wasted sugar.

THE HONEY CROP.

In times of war or other emergency our normal supply of sugar may be curtailed, and in the present crisis the American people would fare better if beekeeping had been more fully developed. The present honey crop of the United States rarely exceeds 250,000,000 pounds. That the country

produces even this much is unknown to most people, for, while honey was the chief form of sugar used in ancient times, the case of getting cane or beet sugar has placed honey in the background. Now that our sugar supply is reduced by reason of supplying our allies with part of the sugar they need, the demand for honey has increased, not only domestically but for export. It is now openly a matter of regret that the United States did not have enough skilled commercial beekeepers to harvest several times the honey crop of 1917.

WHY YIELDS ARE FREQUENTLY SMALL.

It must not be assumed that the only requirement for obtaining honey is to buy some colonies of bees and permit them to forage for nectar. To keep bees profitably requires study, and labor at just the right time. Because of lack of attention, fully half the bees now kept in the United States are virtually useless to their owners, and consequently beekeeping is often condemned as unprofitable. The reasons for the unprofitableness of most colonies of bees will be discussed briefly.

Bees gather nectar for their immediate use, to provide food for the developing brood, and to provide stores for periods when no nectar is available. Except in the extreme South, there is no nectar available during the winter season, and provision must be made to carry the colony over this period, for, unlike other insects, the honeybee does not hibernate. The amount of honey used by a colony simply to maintain its existence during the year is large. Just how much is used by an average colony has never been determined with accuracy, and there are many complicating factors which make this a difficult question to solve. It will perhaps not be far from the truth to assume that this amount is at least 400 pounds.

On this assumption, then, every colony must gather its 400 pounds before there is any honey for the beekeeper. The honey removed for human use is usually spoken of as "surplus" by beekeepers, and this is literally its correct name. When weather conditions are unusually favorable for nectar secretion the task of gathering this amount is easy, and under such circumstances there is some surplus for every bee-



FIG. 1.—POOR EQUIPMENT, POOR MANAGEMENT, POOR RESULTS.
The owner of these bees claims that beekeeping does not pay, yet the bees insisted on storing honey even outside the "gum."



FIG. 2.—GOOD EQUIPMENT, POOR MANAGEMENT, POOR RESULTS.
This apiary was almost destroyed by disease before the trouble was discovered.



FIG. 1.—GOOD EQUIPMENT, GOOD MANAGEMENT, GOOD RESULTS.
From apiaries such as this the country's honey crop is secured.



FIG. 2.—WINTER PACKING CASE FOR FOUR COLONIES OF BEES.
It is impossible to overpack bees in winter.

keeper. In most seasons, however, nectar is not secreted so freely, and only the beekeeper who properly manipulates his bees gets a surplus. Probably in an average season, for the United States as a whole, the surplus honey obtained by good beekeepers will scarcely exceed 50 pounds per colony.

This average of 50 pounds surplus represents, then, only one-ninth of the nectar gathered by the bees. In such an average season an apiary of 100 colonies may gather nectar equivalent to $22\frac{1}{2}$ tons of honey, whereas the "honey crop" or surplus honey will be only $2\frac{1}{2}$ tons. That 100 colonies of bees can find nectar sufficient for $22\frac{1}{2}$ tons of honey within a radius of about 2 miles will give one some idea of the amount of sugar available in the form of nectar. This amount is doubtless much below the actual sugar at hand, for when nectar is flowing freely bees do not get it all. Furthermore, in many places more than 50 pounds surplus is obtained, and often more than 100 colonies can be kept profitably in one place.

In the face of these facts it is regrettable to find so many beekeepers who fail to get even the small percentage which belongs to the beekeeper. There are parts of the United States where nearly 90 per cent of all colonies of bees are in hollow logs (Pl. LXVIII, fig. 1) or plain square boxes, in which combs and bees can not be handled. There are few parts of the country where the box hive is not found, and probably one-third of all the bees in the country are so housed. In this case both equipment and management are poor and the energy of the bees is misdirected.

Even of those who keep their bees in modern hives with movable frames, the vast majority do not get the full crop. By failing to control swarming, by providing insufficient room for storage, or by lack of proper care in winter their crop is often reduced one-half or more. The equipment is good, but the management is poor and much of the energy of the bees is wasted.

GOOD MANAGEMENT THE PRICE OF SUCCESS.

The bright side of the picture is seen in the minority of apiaries where the bees are properly housed in good hives, where swarming is controlled, where surplus room is given

on time and in abundance, and where the bees receive adequate protection and care in winter. (Pl. LXIX, figs. 1, 2.) Beekeepers who so manipulate their bees receive an adequate return for their labor, and since it is only the good beekeepers who get all the available surplus, it may be safely stated that surplus honey is directly traceable to study and care. Many good beekeepers in the United States receive a good living from their bees and have incomes equal to that of a prosperous farmer in other lines of agriculture. This results from properly directing the energy of the bees.

The productive colony of bees may be figuratively likened to a machine which consumes in friction 90 per cent of the energy applied. This is not a high degree of efficiency when measured by this standard. The colony in a box hive, then, is likened to such a machine in bad repair and with no attention, in which all the energy is used simply to drive the wheels. Such a machine is totally unproductive. The properly housed colony, which is badly manipulated, is, then, comparable to a machine in good repair but in the hands of a poor mechanic. Such a machine may do fair work for a time, but the mechanic fails to do the necessary work at the right time and the machine is only occasionally productive. Finally, the productive colony is like a good machine in the hands of a good mechanic. While energy is consumed simply to run the machine, the good mechanic does the right work at the right time and obtains the greatest possible reward in the machine's output. Such a figurative comparison must not be carried too far and is used here only to point out the lamentable waste in much present-day beekeeping.

SOURCES OF LOSS.

Of the major sources of loss the greatest is the death and weakening of colonies in winter. By starvation or exhaustion of vitality the average winter loss of most localities is fully 10 per cent. Strangely enough this loss is practically as high in the South as in the far North. An industry which can continue to exist while suffering a 10 per cent loss annually must be one of great promise if this loss can be reduced. Furthermore, of those colonies which remain in the spring, the population is often lamentably reduced. Nor-

mally no brood is reared in winter, although abnormal and unseasonal brood rearing is so common as to be considered almost normal by many beekeepers. The reduction in numbers and especially in vitality of the bees still remaining makes it impossible for many colonies to gather a surplus from the earlier nectar sources, and much honey is lost while the colony is regaining its strength. It is not at all unusual for the honey crop to be reduced one-half by poor wintering. Yet the winter loss can be reduced readily to less than 1 per cent.

A second source of loss is from two infectious diseases of the brood of bees, European foulbrood and American foulbrood. Within the past few years many of the States have provided for apiary inspection, and in all but a few States these diseases are sufficiently controlled to permit commercial beekeepers to conduct their work with virtually full returns. In spite of such success the annual loss of colonies from disease is probably \$2,000,000, and many beginners in beekeeping are discouraged by the disease situation. This source of loss is therefore a serious one. (Pl. LXVIII, fig. 2.)

When a colony becomes populous during a good honey flow it normally makes preparation to swarm, thus dividing itself into two colonies. While this instinct is advantageous to wild bees, it results in a reduction in the honey crop if the division occurs, as it usually does, just before or during the time when nectar is especially abundant. Rarely can swarming be entirely prevented, even with the best of care, but the proper measure of a beekeeper's skill is his success in reducing this activity. A failure to attempt this causes untold loss in honey every year, and the methods of swarm prevention and control can be understood only by careful study and experience.

The proper giving of room for surplus honey is important in this connection. It is an unusually good locality in which nectar is abundant all summer and this room must be given at just the right time. This necessitates watchful study of the nectar-producing flowers. It is quite a common practice for beekeepers to put on one "super" for the storage of surplus honey and to wait until this is entirely filled before giving more space. This results in the loss of much honey from lack of storage space, and often too much is stored in

the part of the hive which should be devoted to brood rearing. The proper placing of room for surplus honey requires vigilance and study, and a failure to provide this room on time and in the proper way often may reduce the crop to one-third.

BEEKEEPING AN EXACTING CALLING.

These more common sources of loss are mentioned to show that a failure to make a success of beekeeping almost always results from a lack of study of the needs of the bees, combined with a failure to do things on time. Beekeeping is therefore essentially an industry which requires studious care, and in consequence the proper development of this branch of agriculture necessitates to an unusual degree the dissemination of information of a rather detailed nature. While there are published bulletins and books which contain the needed information, these have not proved adequate in developing beekeeping to the extent that is possible and to a degree which would be profitable.

It is quite possible for the American beekeeping industry to be developed so that the honey crop will be ten times what it is at present. Not only would such a development be valuable in an emergency, such as the present crisis, but in normal times the beekeeping industry can provide a concentrated nutritious food, almost universally liked and assuredly an article of diet preferable to the inferior sirups and jams so commonly used. The beekeeping industry may be the means of conserving a national resource now largely wasted, changing it into nature's own sweet. The raw material is free on every hand; the investment for equipment is small in comparison with other branches of agriculture; the profits are fully commensurate with the study and labor involved. It would seem profitable to stop such a waste of so desirable a supply of sugar. This waste can be prevented only by the education of beekeepers.