#14

INDOOR WINTERING:

RESEARCH HIGHLIGHTS

D.L. Nelson & G.D. Henn

Research Station, Beaverlodge, Alberta

Contribution No.

NRG 77-10

August 1977

Indoor Wintering: Research Highlights

Preface

This mimeograph has been prepared to familiarize beekeepers with some of the results obtained from wintering studies at the Beaverlodge Research Station. Each test was conducted for one year and thus results obtained by beekeepers, using the same method, could vary depending on conditions and wintering facilities. The mimeograph also outlines one method that the authors feel will help beekeepers successfully winter colonies indoors. Although, there are many other methods and systems which have also been used with a great deal of success; see appendix for recent indoor wintering articles.

Introduction

Wintering is certainly not a new idea. However, the emphasis has changed and compared to 1969 when approximately 6,000 colonies were wintered in western Canada, there are now about 40,000 (excluding southern B.C.). Along with increased wintering has been an expansion of the beekeeping industry both in the commercial and hobby sectors.

This expansion has brought with it several problems. Firstly, the U.S.A., our only source of packages, has been hard-pressed at times to meet the new demand. Poor spring weather has delayed some deliveries and some feel the quality of queens and packages has gradually declined. However, the main factor to stimulate interest in wintering has been the increased prices for package bees.

To contend with the supply, quality and price problems, there are two feasible approaches. One is to develop alternative sources of supply and secondly to winter colonies in Canada. Although, the development of alternative sources is important, it appears that wintering will be more suitable, over the long-term, for stabilizing the Canadian beekeeping industry.

Should You Winter Your Bees?

Knowledge and experience are required for wintering colonies indoors or outdoors. Wintering is not a simple extension of the beekeeping season or operation, but rather a whole new system, requiring new and different thinking. It is therefore apparent that many traditional package bee management practices will have to change to make wintering a successful alternative to package bees.

Advantages: (1) Selecting and queen rearing for wintering qualities and high honey production and/or for regional conditions and particular management systems; (2) Wintering on location provides opportunity to manage bees according to spring weather conditions, which is not always the case with pre-scheduled packaged bees; (3) Wintering colonies with

proper spring management should provide larger populations at an earlier date, which can take advantage of early nectar flows. Because wintered colonies are stronger, they will not be affected to the same extent as packages by a cold spring; (4) The supply and quality of bees can be assured and it should prove cheaper than importing packages, considering the potential increase in production; (5) Year-round involvement by the beekeeper should stimulate and develop better beekeepers rather than just 'honey producers'.

Disadvantages: (1) Greater labour requirements during requeening, colony selection, packing and/or moving; (2) There may be a problem of obtaining replacement queens for either fall or spring replacements; (3) The beekeeper may have to become involved with queen rearing to obtain good wintering stocks; (4) Wintering may be an additional worry to some beekeepers; (5) Spring management is more intensive than with package colonies and management must change to take advantage of wintered colonies potential.

As far as indoor versus outdoor wintering, each beekeeper will have to determine which suits his particular needs. Each has their advantages and disadvantages.

Description of Wintering Buildings

During the last six years, wintering research at Beaverlodge has looked at several problems relating to indoor wintering. Because self-sufficiency of the industry will be brought about by many beekeepers wintering, this research has been done in simple buildings with equipment that does not require a large investment.

Results presented here were obtained by wintering colonies in two buildings, 6 ft. wide, 6 ft. high and 23 ft. long (approximately 830 cu. ft.). Each was well insulated, had double doors and had a 1500 watt baseboard heater and a 150 c.f.m. bathroom fan for ventilation. Positive ventilation pulled air in at the top of one end of the building and forced air out at floor level, through two exhaust ports. Each exhaust port had a slide which could be used to control air flow. The heater and fan were thermostatically controlled which permitted temperature control within the restrictive limits of the outdoor temperatures. There was no air-conditioning. The fan was connected to a time switch so that it would come on for two 30-minute periods each day; or when the temperature rose above 43°F. The temperature was maintained at 40°F ± 2° except when outside temperatures influenced the inside temperature. When this occurred, the doors would be left open during the night so the building could cool down and then they were closed again in the morning. The inside of the building was in total darkness. The relative humidity was not monitored nor was it controlled. Twenty-four hour temperature recordings were monitored with a thermograph.

Colony Preparation

During the summer, disease-free colonies were selected for desirable behaviour, brood build-up, and honey production characteristics. Anytime after the nectar flow, these colonies were prepared for wintering. Colonies would be left three high after the honey crop had been removed. From these one of the following would be prepared depending on the test; singles (S), doubles (D), or singles plus a second super of honey (S+), the honey super to be added when the colonies were moved indoors. Since we were dealing with less than 60 colonies per year, we usually found the queen in each colony and moved her into the brood chamber.

Singles (S) were prepared by placing two frames of mostly capped brood, two pollen frames and five heavy honey frames into the brood chamber. The queen can either be located and placed into the brood chamber or the bees must be driven or shaken into, or in front of the hive. If the latter method is employed, check for eggs or the queen after about five days. In some cases, two singles may be prepared from one large colony, in which case the queenless hive will have to be requeened. Each single should have a gross weight of 85 lbs.; if not, extra feeding is required.

Doubles (D) were prepared in a similar fashion except three or four frames of mostly capped brood were placed in the brood chamber with two or three frames of pollen with the remainder being honey. The second super should be mainly honey. The gross weight for a two story colony should be at least 135 pounds.

Singles plus a second super (S+) were prepared in the same manner as singles described above. However, a second super of honey weighing at least 40 pounds is prepared and put into storage until the colonies are moved indoors. At this time the second super is added.

In all of the above treatments, we feed at least 10 pounds of sugar in the form of 2:1 sugar syrup with antibiotics and fumidil-B. If you do not wish to make your colonies up with honey, or if the gross weight is under the suggested figures, 30-50 pounds of sugar syrup may be fed to bring each colony up to the desired gross weight.

If large quantities of sugar syrup are fed to colonies, it must be done early in the fall so the bees can work the sugar syrup and place it in the brood nest.

When fall temperatures become cool, usually late October or early November, and before significant snowfall, the colonies are moved into their wintering quarters.

When wintering without air-conditioning, a maximum of one hive per 30-35 cu. ft. is suggested. If wintering with adequate air-conditioning this can be increased to 1 hive per 15 cu. ft. It is important particularly in the early fall and in the late spring not

to have too many colonies in a building without air-conditioning. In most wintering facilities this allows you to stack singles four or five high and doubles two high. There must not be any light coming into the building.

Research Results

I. The use of top insulation

There is usually a 30-50 day period in the fall when colonies are left outdoors before being moved inside. It was very noticeable once cool weather and night-time frost begin that heat loss through ordinary lids is substantial. A test in 1973 showed that over the 49-day period, colonies with 2 inches of fibreglass insulation placed in a 2½ inch tray under the cover, significantly reduced colony weight loss (see Table 1).

Another advantage of top insulation is that the bees do not cluster as soon or as tightly as colonies without insulation. In the fall, it is probably not as important as in the spring when the cluster may require extra mobility to get at badly needed food stores. In some years the weight difference may not be evident, because of available nectar during the fall period. However, we feel top insulation is very important as far as spring management is concerned.

Either insulated covers (at least 3/4 inch styrofoam) or insulated trays placed under the cover (2 inch fibreglass) are highly recommended. They are left on from the time colonies are prepared in the early fall until at least mid-May. Tests have shown no reduction in weight loss during the indoor wintering period.

Table 1. Comparison of fall weight losses between colonies with 2" fibreglass top insulation and those without insulation (1973-1974).

	Insulated	Not Insulated
Number of colonies	16	16
Average weight loss/hive (lbs) (Sept. 18 - Oct. 27) 49 days	9*	11.3
Average weight loss/week (lbs)	1.3	1.6

* significant reduction in weight loss, 5% level

II. Doubles versus singles plus a second super

A comparison of colonies prepared in the fall in two chambers

and those prepared as singles but wintered as doubles during the indoor period was conducted in 1974. It was very evident that the colonies prepared as doubles consumed more stores during the fall and winter. We feel this consumption difference is primarily due to the difference in populations. The total consumption for the doubles (D) and the singles plus a super (S+) was 53.6 lbs. and 32.2 lbs., respectively. However, the capped brood area and frames of bees was not significantly different in the spring. Advantages of the (S+) treatment are; easier to move into wintering quarters, cluster in a better position in the spring, and usually do not require any attention for 2-3 weeks after being moved outside. Conversely, the doubles often eat their way through the second super during the fall and early winter period, which often leaves badly needed honey stores in the bottom super. Often they need attention within the first couple of days after being moved out, to maintain food stores in contact with the cluster.

Table 2. A comparison between colonies prepared as Doubles (D) with those prepared as Singles and wintered as Doubles (S+) (1974-1975).

	D	S+
Number of colonies	12	6
Average weight loss (lbs) (Sept. 15 - April 7) (204 days)	53.6	32.2
Average capped brood (cm^2) April 23	1210	1184
Number frames of bees, April 23	6.3	6.8
Number dead colonies	0	1
Number queenless	1	0

D = colonies prepared as doubles (2 supers) and wintered as doubles.

S+ = colonies prepared as singles, wintered as doubles, 2nd chamber (mostly honey) placed on hive when moved inside, Oct. 29.

III. Moving colonies outside during mild weather

During the spring of 1975, there was a mild period of five days in mid-March. Maximum temperatures reached 42°F on two consecutive days. As the warm period started, it was decided to move 12 colonies outside and then move them inside again. It was hoped that the colonies would get some flying weather and possibly light stimulation which would encourage brood rearing. The colonies were outside for three days.

It appears that moving colonies outside for such a short period

is detrimental to colony development (see Table 3). The main difference seems to be a set-back in brood production when measured later in the spring, i.e. 23 April. This set-back was probably due to the cold night-time temperatures and a restriction of the cluster. Bee flight was very evident during the three days but many bees were lost as evidenced by the number in the surrounding snow. It was also evident that excess bees were lost after the colonies were again moved inside, as quite an accumulation of bees occurred on the floor compared to the colonies left inside. It appears to be quite detrimental to move bees outside and back into wintering quarters. If colonies must be moved outside, they should be left outside and possibly provided with a light girdle of insulation.

Table 3. Comparison of 2 chamber colonies moved outside in mid-March for 3 days to those left inside (1974-1975).

	Moved Outside	Remained Inside
Number of colonies	12	12
Average weight loss (lbs) Sept. 15 - April 7 (204 days)	45.6	53.6
Average capped brood (cm^2) April 23	301	1210
Frames of bees April 23	5.9	6.3
Number of dead colonies	0	0
Number queenless	2	1

IV. Singles versus Singles plus a Second Super

Comparisons between colonies prepared and wintered as singles (S) and colonies prepared as singles but wintered as doubles (S+) were made in 1975. The data clearly shows that in the test year, (S+) colonies were superior to (S) colonies (see Table 4). The main differences were amount of capped brood, adult population, and number of dead colonies on 3 May.

The most important aspect is the difference in number of dead colonies and the amount of spring management required. When the singles (S) are moved outside most require immediate attention to their food stores, either in amount or location relative to the brood nest. The doubles (S+) on the other hand have adequate stores in the second super for at least a two to three week period. This means that these colonies can be moved outside without immediate attention, which allows the beekeeper to choose days suitable for inspection and spring management.

Table 4. Comparison between colonies prepared and wintered as Singles (S) with those prepared as singles and wintered as Doubles (S+) (1975-1976).

	S	S+
Number of colonies	16	16
Average weight loss (lbs) Sept. 7 - April 4 (209 days)	33.6	40.6
Average capped brood (cm^2) May 3	1420	1780
Number frames bees, May 26	6.7	11.5
Number dead colonies	3	0
Number queenless	1	2

S = colonies prepared as singles and wintered as singles.

S+ = colonies prepared as singles, wintered as doubles; 2nd chamber (mostly honey) placed on hive when moved inside, Oct. 27.

V. Singles versus singles plus the second super and stimulative treatments.

The previous tests indicated that (S+) colonies were the most suitable method for wintering colonies under our particular management and wintering regime. However, it was felt that more could be done to stimulate colonies and thus eliminate or lessen the common phenomena known as spring dwindling. The two treatments used to stimulate colony development were the feeding of sugar syrup to colonies indoors, and the moving of colonies outdoors about mid-February.

Colonies fed sugar syrup starting February 22nd and colonies moved outside on February 22nd and provided with a light girdle of insulation were superior to the colonies in the other treatments as of 28 April (see Table 5). To fully evaluate such treatments the colonies should be followed through the production period. However, this test was not done and further evaluation will be conducted.

Table V. Comparison between colonies wintered as singles, singles plus a 2nd super, feeding syrup, moving outside and those wintered outside (1976-1977).

	S	S+	S+-F	S+-M	S+-O
Number of colonies*	8	8	8	8	8
Average weight loss (lbs) Sept. 23 - April 7 (197 days)	27	44	45	42	42
Average capped brood (cm^2) April 28	750	843	1466	1021	841
Number dead colonies	0	0	0	0	1
Number queenless	3	0	0	1	0

S = colonies prepared as singles and wintered as singles.

S+ = colonies prepared as singles, wintered as doubles; and chamber (mostly honey) placed on hive when moved inside Nov. 19.

S+-F = colonies the same as S+ except they were fed sugar syrup starting February 22.

S+-M = colonies the same as S+ except they were moved outside Feb. 22, lightly wrapped and fed sugar syrup starting March 14, and pollen supplement starting March 31.

S+-O = colonies the same as S+ except they were wintered outside in groups of two with insulation.

* colonies moved inside on 19 Nov. and moved outside 7 April.

SUMMARY

A. Fall Preparation - Comparisons of singles (S), doubles (D), and singles plus a second super (S+) showed that colonies prepared and wintered as (S+) were the most suitable because:

1. They are easy to make up and are uniform after preparation
2. They are not large colonies and do not consume large amounts of stores during the fall period before being moved inside.
3. Singles are easier to move inside; and then add a second super.
4. In these studies, there have been fewer dead colonies than in the (S) colonies.
5. Generally, there appears to be an increase in brood and more bees compared to (S) and (D).
6. The colonies can be outside in the spring for two to three weeks before they need additional feed; other than possibly pollen supplement.

B. Top Insulation - These preliminary results suggest that insulated covers or insulation chambers under the cover reduce fall consumption, conserves cluster heat allowing the cluster to maintain a larger brood nest and maintain contact with food stores under adverse conditions.

C. Methods of Stimulation - In 1976, moving outside in mid-February with a light girdle of insulation and some syrup feeding and the feeding syrup to colonies indoors appears to stimulate colony development significantly. The inside feeding seems to have the most influence, probably because the brood nest can be expanded to a greater degree due to the moderating effect of the controlled environment.

D. Time of Preparation and Moving Colonies - Over the period of this study, colonies were generally prepared and fed sugar syrup by 15 September. They were usually moved inside the last week of October except in 1976; it was a mild November and colonies were left outside until 19 November. In most years, the colonies had to be moved outside by the 7 to 10th April because the temperatures were too warm inside the building during the daytime. (i.e. up to 55 to 58^{O}F).

APPENDIX

Recent Indoor Wintering Information

Baker, R. G. 1975. Indoor Wintering of Honeybee Colonies in Manitoba. Can. Beekeeping -

Pirker, Y. 1976. Here's How Pirkor Produces our First Packaged Bees. Alberta Bee Culture Vol. 1 (2)

Kessler, G. 1976. Kessler's System of Indoor Wintering Alberta Bee Culture Vol. 1 (1) p. 10

Pawlowski, S. 1976. Pawlowski's plan for Indoor Wintering. Alberta Bee Culture Vol. 1 (1) p. 12

Beauchesne, F. 1976 & 1976. Wintering results. Provincial Reports; Can. Ass. of Professional Agriculturists.

McCutcheon, D.M. 1977. Wintering Honeybees in a Controlled Atmosphere Chamber. Can. Beekeeping Vol. 6 (8), 98-102.

Wrubleski, E. M. and S. E. Bland. 1976. Honeybee Overwintering - Management and Facilities. Sask. Dept. of Agriculture, June 1976.