

Wintering of Bees In Minnesota¹

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AT PRESENT the beekeepers are still divided on the question of how best to protect their colonies during winter in order to help bees conserve heat and thus bring about smaller consumption of stores and better wintering.

Philips & Demuth (1914) on the basis of their experiments, recommended protecting the hives by packing them in wooden cases with an insulation of planer shavings several inches thick. Merrill (1920, 1923) concurred with this and emphasized the importance of a windbreak, especially for colonies which have no other form of protection. The experiments conducted by King (1923) also pointed to the importance of good packing.

However, there is an increasing number of research workers who claim that neither heavy nor light packing is necessary. Wilson & Milum (1927) concluded from their observations that colonies winter well out-of-doors with no insulation or with from 1½ inches to 10 inches of insulation. Of hives which were protected from the prevailing winds by buildings or windbreaks, those without insulation seemed to do as well as those in packing cases. Milum (1930) found very negligible differences in the winter food consumption between packed and non-packed colonies. Farrar (1934, 1943, 1952, and 1963) stressed the importance of pollen for the wintering of bees. He demonstrated that brood-rearing in winter is a natural phenomenon and that those colonies which had enough stores of pollen and honey, and plenty of young bees and a good queen, wintered without packing and yielded just as good a crop as those wintered with such protection. He came to the conclusion that wintering in three stories is more satisfactory than in two stories. Packing in itself was of little or no value and heavy packing was worse than none. The locality was not much of a factor in wintering bees. There did not seem to be much difference in colony requirements, because the variations were

as great between seasons in one locality as between localities. He stressed the importance which Nosema, a protozoan disease of the adult bees, plays on the outcome of wintering.

METHODS.—In order to test these two types of wintering, an experiment was conducted at the University of Minnesota Agricultural Experiment Station for a number of years. In the second half of August of each year the colonies were inspected and the number of frames of brood in each was ascertained. Then the colonies in each yard were divided into three groups in such a way that the colonies in each group had, on an average, about the same number of frames of brood. This was done in order to have in each group, colonies of approximately the same strength. Ample stores were left in each colony for wintering. All colonies had 1-inch insulite board on the top of the inner cover, with the bee escape hole left open. One group of colonies in each yard was left without packing. During the 1943/44-1953/54 decade the colonies in the second group were lightly protected by either a corrugated paper case with a single building paper wrap or a double building paper wrap. The third group was well protected by either double corrugated paper case or balsam wool wrap, both having one protective single building paper wrap besides, or half-inch insulite boards. During the 1954/55-1964/65 decade the building paper wrap was not always applied and mostly corrugated paper cases were used for packing. Middle entrances were provided in all hives by placing strips of wooden shingles on the side walls of the first story. These entrances were contracted to about 3 inches in length. The lower entrances were completely closed.

The colonies in the Old Yard at the Fruit Breeding Farm at Excelsior, Minnesota, were located on a dry, very gradual south slope with no special windbreak nearby during the first decade and a relatively good one during the second decade. The entrances of the hives faced south. The New Yard had a good windbreak from the south



and west and there were low hills of apple orchards surrounding the apiary from the north and east. The location was not as well drained as the one on the Old Farm. The hive entrances faced south. The St. Paul Campus yard had a good windbreak from all sides except from the north-northeast. The hives were located on the northeast slope and the hive entrances faced northeast.

During the first decade before packing, all colonies were weighed. They were left undisturbed throughout the winter. An inspection in March was made to ascertain the number of dead colonies. Afterwards all the necessary manipulations were performed according to the advance of the active season. At the end of April, or the beginning of May, all colonies were weighed and later the number of frames of brood in each colony was counted.

RESULTS.—The results of the experiment for the winters of 1943-44 to 1953-54, inclusive, are presented in table 1. From the data presented it is evident that there was not much difference in the average food consumption of the colonies wintered in either group within each yard. However, consumption by the non-packed group in each yard was somewhat greater than in the packed groups. The consumption of stores in all three groups of colonies in the St. Paul Campus yard was the lowest. This was, possibly, due to a better wind protection in this yard. The average fall brood was about the same for the colonies in each group. However, the count of the brood in the spring showed that a larger number of frames of brood was present, on the average, in the packed colonies than in the non-packed group.

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Table 1. Results of packing versus not packing colonies of honey bees in separate yards in Minnesota during the winters of 1943/44 to 1953/54 inclusive.

Yard	No. of Colonies	Stores consumed lbs.	No. Frames of brood		No. of colonies lost		Total ^(a)
			Fall	Spring	Dead ^(a)	Weak and/or queenless ^(a)	
Not packed							
St. Paul Campus	89	46	5.0	3.2	13(14.6)	16(18.0)	29(32.6)
Fruit Farm Old	99	60	5.4	4.1	21(21.2)	10(10.1)	31(31.3)
Fruit Farm New	83	61	5.1	3.6	16(19.3)	17(20.5)	33(39.8)
	271	56	5.2	3.6	50(18.4)	43(15.9)	93(34.3)
Lightly packed							
St. Paul Campus	121	42	4.9	3.9	6(5.0)	15(12.4)	21(17.4)
Fruit Farm Old	136	55	5.2	4.3	10(7.4)	13(9.6)	23(17.0)
Fruit Farm New	105	57	5.2	4.8	7(6.7)	4(3.8)	11(10.5)
	362	51	5.1	4.3	23(6.4)	32(8.8)	55(15.2)
Heavily packed							
St. Paul Campus	170	40	4.9	3.9	5(2.9)	15(8.8)	20(11.7)
Fruit Farm Old	102	56	5.0	4.7	3(2.9)	4(3.9)	7(6.8)
Fruit Farm New	69	54	5.4	4.9	2(2.9)	7(10.1)	9(13.0)
	341	50	5.1	4.5	10(2.9)	26(7.6)	36(10.5)

(a) Percentages given in parentheses.

The most pronounced difference was in the number of colonies which were lost for the next year's production. The loss in dead colonies was the greatest in the non-packed groups in all yards, being three times as great as in the lightly-packed group and 5 to 7 times greater than in the heavily-packed group. It is apparent that there was also a considerable difference between the lightly-packed and the heavily-packed group. The average losses in dead colonies for all three yards was 18.5%, 6.4% and 2.9% for non-packed, lightly - packed and heavily - packed groups, respectively.

The results of the experiments for the winters of 1954/55 to 1964/65 are presented in table 2.

There was the same tendency of a better survival in the packed than is the non-packed group, mortality being 33.5%, 12.8% and 10.7% for the non-packed, lightly packed and heavily packed groups respectively. However, there was not much difference between the results of wintering of the lightly packed and the heavily packed groups. In all cases the St. Paul campus yard showed a better survival than the other two yards. The count of brood in the spring also showed that a larger number of frames of brood was present in this yard. However, there was not much difference in the average number of frames of brood in all three yards.

The combined results for both decades are presented in table 3.

From the table it is evident that packing colonies in the fall resulted in a much better survival of overwintered

colonies, the mortality being 25.7%, 9.0% and 6.2% for the non-packed, lightly packed and the heavily packed groups, respectively.

The results of this experiment agree closely with a similar 13-year experiment conducted by Braun & Geiger (1955) in Manitoba. These workers found the losses in dead colonies 33.3%, 13.3% and 5.9% and the average spring brood count was 5.7, 7.0 and 8.7 frames for non-packed, lightly-packed and heavily-packed colonies, respectively.

These numbers closely correspond to those obtained in surveys made by Rea (1941) in New York (2.8% loss for heavy-packed and 50.8% for non-packed); Dunham (1941) in Ohio 10.9% for packed and 34.1% for non-packed); Haydak & Floyd (1955) in Minnesota (42.5%, 18.7% and 10.1% loss for non-packed, lightly-packed, and heavily-packed colonies, respectively). Thus it appears that under Minnesota conditions packing colonies helps the bees withstand the adversities of the winter weather better than if

Table 2. Results of packing versus not packing colonies of honey bees in separate yards in Minnesota during the winters of 1954/55 to 1964/65 inclusive.

Yard	No. of Colonies	Frames of brood		No. of colonies lost		Total ^(a)
		Fall	Spring	Dead ^(a)	Weak and/or queenless ^(a)	
Not packed						
St. Paul Campus	73	6.3	5.7	22(30.1)	2(2.7)	24(32.8)
Fruit Farm Old	93	6.0	4.3	28(30.1)	13(14.0)	41(44.1)
Fruit Farm New	88	5.4	4.2	35(39.8)	11(12.5)	46(52.3)
Total	254	5.9	4.7	85(33.5)	26(10.2)	111(43.7)
Lightly packed						
St. Paul Campus	72	6.1	5.4	9(12.5)	3(4.2)	12(16.7)
Fruit Farm Old	82	5.7	4.6	11(13.4)	13(15.8)	24(29.2)
Fruit Farm New	76	5.2	4.7	11(14.5)	4(5.3)	15(19.8)
	240	5.7	4.9	31(12.8)	20(8.3)	51(21.1)
Heavily packed						
St. Paul Campus	69	5.7	5.1	6(8.7)	1(1.4)	7(10.1)
Fruit Farm Old	90	6.1	4.5	9(10.0)	7(7.8)	16(17.8)
Fruit Farm New	84	5.6	4.5	11(13.1)	13(15.4)	24(28.5)
	243	5.8	4.7	26(10.7)	21(8.6)	47(19.3)

(a) Percentages given in parentheses.

Table 3. Results of packing versus not packing colonies of honey bees in Minnesota during two decades 1943/44-1953/54 and 1954/55-1964/65 inclusive.

Decades	No. of Colonies	No. Frames of brood		No. colonies lost		Total ^(a)
		Fall	Spring	Dead ^(a)	Weak and/or queenless ^(a)	
Not packed						
1944-1954	271	5.2	3.6	50	43	93
1954-1964	254	5.9	4.7	85	26	111
Total	525	5.6	4.2	135(25.7)	69(13.1)	204(38.8)
Lightly packed						
1944-1954	362	5.1	4.3	23	32	55
1954-1964	240	5.7	4.9	31	20	51
	602	5.4	4.6	54(9.0)	52(8.6)	106(17.6)
Heavily packed						
1944-1954	341	5.1	4.5	10	26	36
1954-1964	243	5.8	4.7	26	21	47
	584	5.5	4.6	36(6.2)	47(8.0)	83(14.2)

(a) Percentages given in parentheses.

they are left without any protective covering.

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