

The Effect of a Comb on the Longevity of Caged Adult Honey Bees^{1,2,3}

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ABSTRACT

Groups of caged honey bees, *Apis mellifera*, L., supplied with a section of comb, survived between 4 and 12 days longer than groups of bees not supplied with a comb.

Experiments with adult honey bees, *Apis mellifera* L., are often conducted in cages that do not have a comb. Recently, a cage that accommodates a section of comb was described (Kulinčević et al. 1973) and used in experiments investigating hoarding behavior (Kulinčević and Rothenbuhler 1973), a virus disease (Kulinčević et al. 1973, Rinderer 1975⁴), the defensive responses of honey bees (Collins 1975⁵), and nosematosis (Rinderer and Elliott 1977). Data from certain experiments suggested that the presence of comb in a cage may increase the longevity of the bees (T. E. Rinderer unpubl.). The experiments reported here were designed to test this hypothesis.

MATERIALS AND METHODS

Bees for each of 3 experiments were obtained from the same source colony. Adult worker bees, 0-24 h old, were collected after they emerged from brood combs held in a 35°C incubator, and placed by groups of 50 into cages similar to those described by Kulinčević et al. (1973). For each experiment, 6 cages contained an 8×6-cm section of dark brood comb attached with paraffin to the back of the cage and consequently having one surface exposed to the bees. Six cages without comb served as controls. All cages were maintained in an incubator at 35°C and 50% RH.

In 2 experiments the bees in all 12 cages had continual access to a gravity feeder containing deionized water and a gravity feeder containing 50% sucrose solution. In the 3rd experiment the bees in all cages, in addition to access to water and sucrose solution, also had access to protein food in

vial caps placed on the floors of the cages. This protein food was made from a mixture of 40 g of Yeaco 20[®] (a protein yeast product), 40 g of sucrose, 20 g of α -cellulose, 20 ml of ethanol which contained a soluble pollen extract, and enough 50% sucrose solution to produce a pastelike consistency. The pollen extract was prepared from a homogenate of 100 g of pollen and 200 ml of ethanol. After the extract was filtered, it was concentrated by evaporation with a cool air stream. The diet was mixed in the evaporation container to avoid loss of pollen extract.

For all experiments, each cage was inspected daily. The dead bees were removed and recorded, until 25 bees in each cage had died. Data on longevity, represented by the number of days required for 25 bees in each cage to die, for cages having comb and cages not having comb, were compared for each experiment by a t-test.

RESULTS AND DISCUSSION

The presence of a comb increased the longevity of caged bees in all 3 experiments (Table 1). Longevity was increased by 12.0, 4.3, and 4.5 days in experiments 1, 2, and 3, respectively. The difference in experiment 1 was highly significant ($P < 0.01$); the differences in experiments 2 and 3 were significant ($P < 0.025$). As expected from other experiments (Beutler and Opfinger 1950) protein feeding resulted in increased longevities. However, the feeding of protein did not mask the effect of the presence of a comb. We therefore conclude that the presence of a comb increases the longevity of caged honey bees.

The precise mechanism underlying the effect of the presence of comb on the longevity of bees is unclear. However, certain speculations can be made. The comb supplies a place for bees to congregate which may reduce stress and restless appetitive behavior (Craig 1918). With a comb, bees have the opportunity to engage in hoarding behavior. Engag-

¹ Hymenoptera: Apidae.

² In cooperation with the Louisiana Agricultural Experiment Station. Received for publication Dec. 6, 1976.

³ Mention of a commercial or proprietary product in this paper does not constitute an endorsement of this product by the USDA.

⁴ T. Rinderer. 1975. The etiological agent of hairless-black syndrome of the adult honey bee, *Apis mellifera* L., and certain factors influencing its infectivity. Ph.D. Dissertation. The Ohio State Univ. 96 pp.

⁵ A. Collins. 1976. Genetics of the response to an alarm chemical by honey bee, *Apis mellifera*. Ph.D. Dissertation. The Ohio State Univ. 103 pp.

⁶ Obtained from Milbrew, Inc., Juneau, WI 53039.

Table 1.—Average longevity for groups of caged honey bees either supplied or not supplied with a piece of comb.

Experiment no. ^a	Treatment ^b	No. of replicates ^c	Longevity ^d ($\bar{X} \pm s$)
1	Comb	6	29.3±7.4***
	No comb	6	17.3±3.8***
2	Comb	6	25.8±3.1**
	No comb	6	21.5±2.7**
3	Comb	6	37.0±3.5**
	No comb	6	32.5±3.2**

^a Bees in experiments 1 and 2 did not receive protein food, while bees in experiment 3 did.

^b Comb was an 8×6-cm section of dark comb with 1 surface available to the bees.

^c Bees/replicate = 50.

^d The number of days required for 25 bees in a cage to die.

* Significantly different from the other mean in the same experiment (*, $P < 0.025$; **, $P < 0.01$).

ing in hoarding behavior may lead to a reduction in stress in cages having a limited array of behavior releasers and consequently increase longevity.

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