Breeding Muğla Honeybee (*Apis Mellifera Anatoliaca)* for Improving

Resistance to Diseases

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Aim

Honeybees are important for pollinating wild and cultured plants. Honeybee diseases and pests have become resistant to the commonly used and previously effective treatment chemicals. Antibiotic treatment of diseases in beehives means that sustained reliance on chemical control measures is not a reasonable method. Different studies have shown that honeybees have genetically determined mechanisms for disease resistance such as hygienic behavior. In this study we aim for genetic improvement in Muğla Honeybee (*Apis mellifera anatoliaca)* resistance to American foulbrood diseases.

Material and Methods

In our project 200 Mugla bee (*A. m. anatoliaca*) colonies collected from Mugla province. Colonies were identified with genetic methods. The position of Muğla bees of the study among 250 honeybee colonies from 18 provinces of Turkey were determined by making use of 30 microsatellite markers. The colonies were kept in standard Langstroth hives. The experimental colonies were managed using standard beekeeping practices. Colonies evaluated 2 times for hygienic behavior on April each year.

To measure hygienic behavior a pin-killed brood assay was used, where all the 100 capped brood cells were counted (a) and cells were punctured using a pin to kill the brood. The treated comb was replaced in the colony and after 24 hours the number of cells that remained capped (b) were recorded.

Hygienic behavior (HB) was the number of cells of dead brood that were removed by the honeybees divided by the total number of cells of brood killed.

$$HB = \frac{a - b}{a} \times 100$$

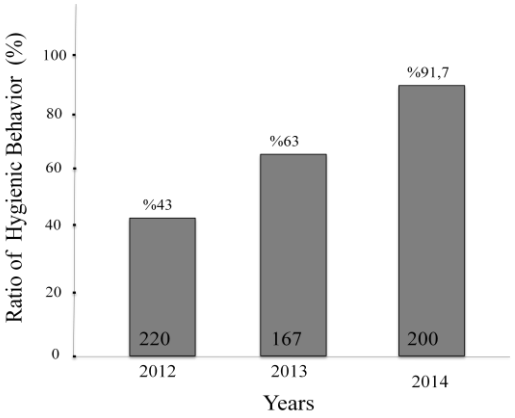
The colonies showing hygienic behavior over %95 in at least two measurements were selected and used as breeder colonies for queen production. Daughter queens instrumentally inseminated with 10 µl of semen from randomly collected drones from the whole population. All inseminated queens were marked and introduced 3 Langstroth frames nuc boxes with pushing cages.

We used “Closed Population” breeding program.

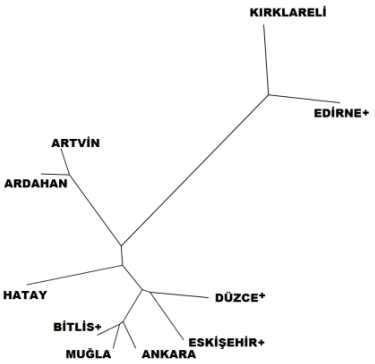
Results

Figure -1 gives the average values of HB for the whole population (mother colonies + daughter colonies), for selected mothers and daughter colonies in each year.

(P <0.001)



Figur-2

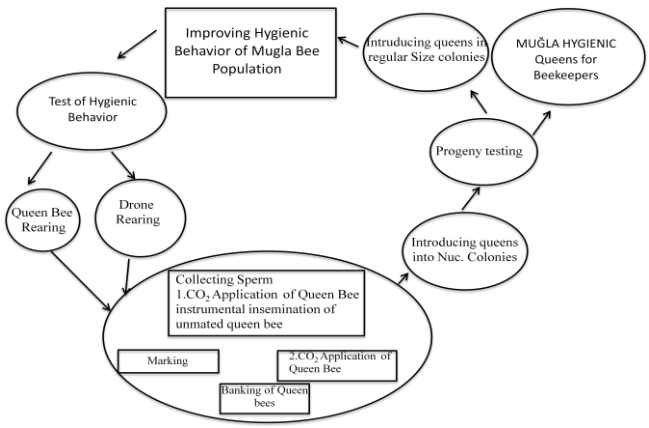


Hygienic behavior increased in the population after 3 year of selection on queens with mating control (instrumental insemination) from 43% in 2012 to 63% in 2013 to %91,7 in 2014. Hygienic behavior ratio was significantly different among 2012, 2013 and 2014 (P <0.001).

Samples from Muğla province were grouped with the samples belonging to the *Apis mellifera anatoliaca* subspecies group distributed throughout Anatolia. Besides this group three additional subspecies clusters of Hatay, Thrace and Ardahan-Artvin regions were observed. Phylogenetic tree constructed based on Nei's genetic distances is given in Figure 2.

We will continue breeding project at 2015. Our goal is to keep and improve Mugla Hygienic bee breeder colonies, reduce the amount of antibiotics used to treat American foulbrood and ensure that our breeding methods and stock are accessible by beekeepers in Mugla.This project was supported by the Ministry of Food Agriculture and Livestock, and Mugla Province Beekeeper Union.

Breeding Model for improving Hygienic Behavior in Muğla



Key words: Honeybees, Genetics, Resistance, Hygienic Behavior, Breeding, Mugla