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Differential melittin concentrations in apitoxin harvested from young versus mature honeybees

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INTRODUCTION

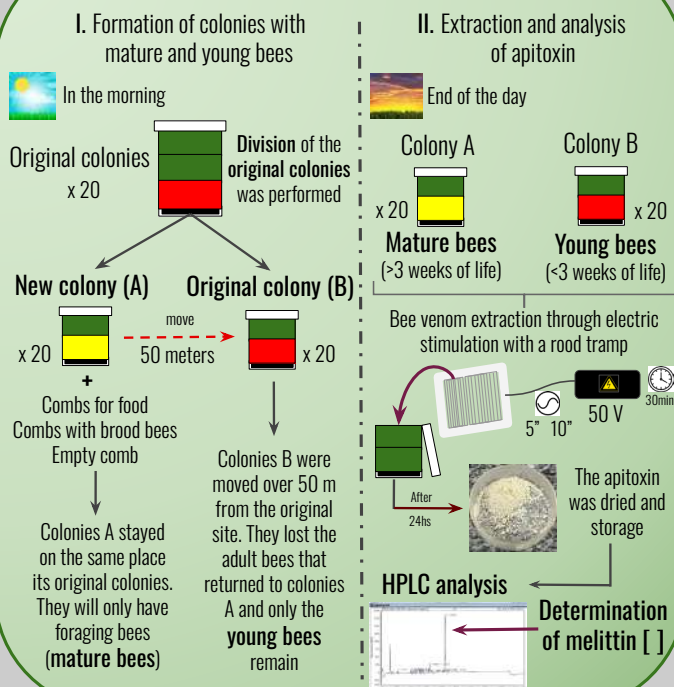
Bee venom is a complex mixture of **bioactive substances** in an aqueous solution. It is referred to as **apitoxin** once its volatile compounds evaporate upon contact with air. This apitoxin **retains the complex composition**, with **melittin** as its main component, representing **40–60%**, although values above 70% have been reported.



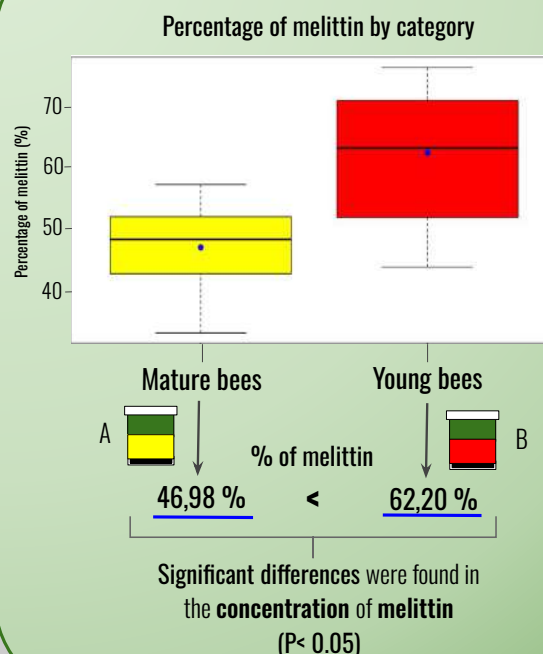
Biological, environmental and other **factors** can **influence venom composition**. **Bee age** at the time of extraction is one of them, as the **trap's location conditions** which bees can access it. This leads to **age variation** among collected bees, which could impact the **proportion of venom components**.

The aim of this study was to evaluate how bee age affects melittin concentration in venom collected from individuals within the same colony.

METHODOLOGY



RESULTS



CONCLUSION

The **higher melittin** concentration observed in **young bees** may be explained by the fact that melittin is **one of the first components synthesized** shortly of adult life, followed by a **decrease** as the venom sac fills. Since **young bees** remain inside the hive while adult (forager) bees are outside searching for resources, the **placement of the venom trap** and the **timing of collection** can **influence the melittin content**, which is why, if these **factors** are controlled, it would be possible to **obtain apitoxin** with a **higher or lower melittin content**.

APIMONDIA
SCANDINAVIA 2025
COPENHAGEN
23-27 SEPTEMBER



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Apitoxin is composed of a complex mixed of bioactive substances synthesized by honeybees and accumulated in the venom sac during the first three weeks of adult life. Different types of traps are used to collect apitoxin, which can be set up inside or outside the hive, allowing access to them by both younger and older bees. This raises the question of whether this could lead to a different composition of the collected apitoxin. Melittin is the major component of apitoxin, and its concentration must be known for commercialization. The aim was to quantify the percentage of melittin in apitoxin from young and mature bees from the same hive. The experiment was carried out in December 2024 (southern hemisphere summer), using 18 well-developed hives (40,000 to 50,000 adult bees). In the morning, the hives were identified and subsequently moved approximately 100 meters. In their place, hives containing only brood frames, feed and empty frames were left. These hives were populated by adult bees from the relocated hives, as they had fixed the original location of their colony. At dusk, the population of each hive was divided into two: the relocated hive with young bees and the hive installed in the original location with adult bees. At night, apitoxin extraction was performed using ceiling traps for 30 minutes. The apitoxin collected from each hive was stored in a marked container for later quantification of the melittin percentage by HPLC. A block design and analysis of variance were performed on the values obtained, revealing differences ($P < 0.001$) in the melittin concentration of the apitoxin from young (62%) and mature (47%) bees. This may be due to the fact that the components of apitoxin are synthesized at different times and/or rates. Therefore, the time and place in the hive where the traps are installed to collect apitoxin must be considered, since different compositions can be obtained from the same hive depending on whether young and/or mature bees access the traps.