

Comparative honey production and hoarding capacity of two native honey bee subspecies in laboratory condition



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PLANT

OBJECTIVE

- ❖ Bridge the knowledge gap on honey production capacity and hoarding behavior of the most common local honey bees subspecies in Algeria ; *Apis mellifera intermissa* and *Apis mellifera sahariensis*.
- ❖ Determine if genotypic difference can determine variability in hoarding behavior and honey production capacity of the two local honeybee subspecies

Rationale

The most common Western honey bees (*Apis mellifera* L.) subspecies present in Algeria are *Apis mellifera intermissa* (Buttel-Reepen, 1906) (fig. 1) known as "Tellian bee" and *Apis mellifera sahariensis* (fig. 2) (Baldensperger, 1924) known as "Saharan bee". Most of the apiaries are essentially composed of Tellian bee despite being reputed aggressive; prone to swarming with abundant use of propolis (Ruttner, 2013), in contrast with Saharan bee known as moderately encline to swarming, a weak defensive behaviour and little propolis use (Haccour, 1960; Ruttner, 2013). Both subspecies have been a subjects of several morphometric, behavioral, physiological and genetic studies (Haddad et al., 2015; 2014; Barour et al., 2011), (Ritter, 1990), (Kefuss, 1995), (Gadbin et al., 1979) and (Clément et al., 2002). However, due to the difficulties to evaluate colonies performance during the natural nectar flow; no study, to our knowledge has documented hoarding behaviour and honey productivity of both subspecies. Therefore, this study is aiming to fill the knowledge gap on these aspects and attempt to confirm or depart from the general beekeepers' "perception" that seem to govern production practices that seem to be harmful at least to the most rare and vulnerable honeybee subspecies; *Apis mellifera Sahariensis*: the Saharan Beauty.

Apis mellifera intermissa, the native honeybee subspecies of Algeria and most of North Africa, is distinctly darker. This honey bee is characterized by a small size, nervousness, aggressive defense behavior and an abundant use of propolis, prone to swarming, produces many broods and can build up to one hundred queen cells



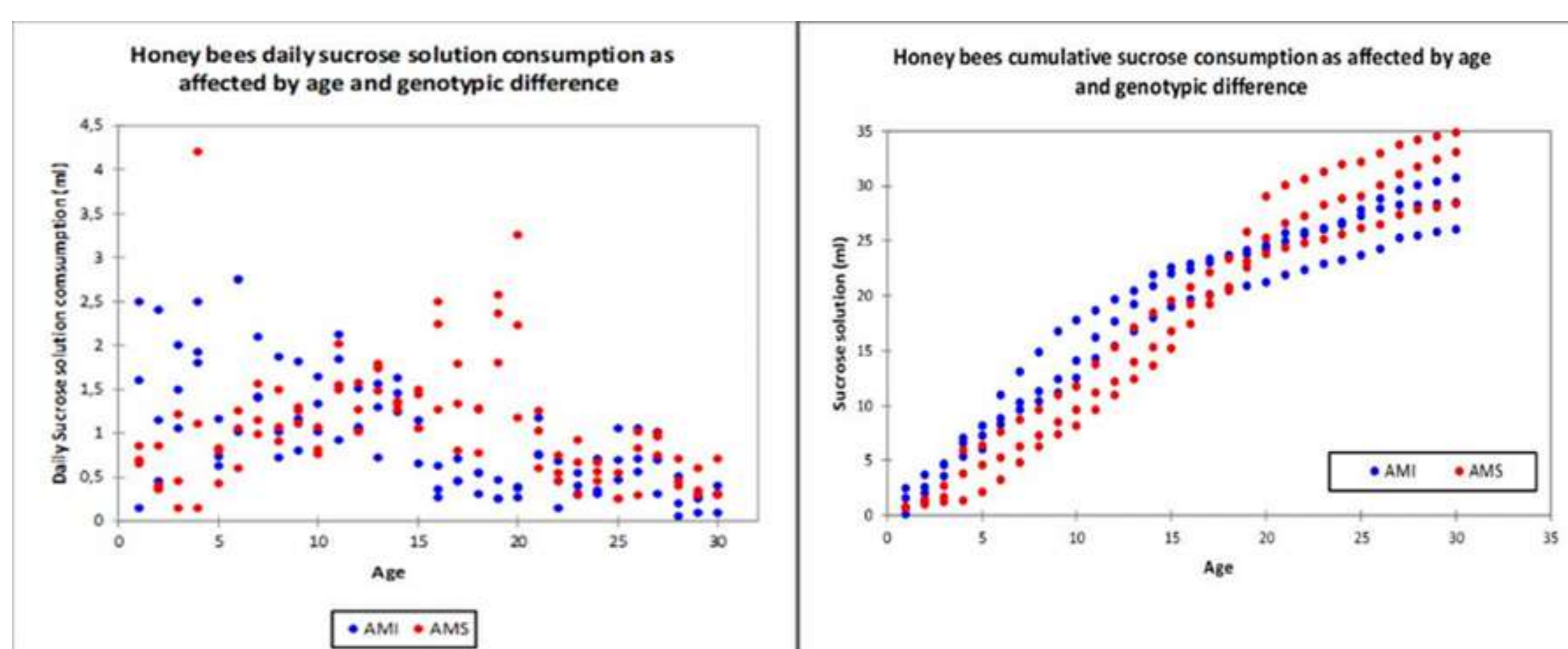
First described by Baldensperger in 1924, it is the bee of the Sahara, its distribution area extends from southern Morocco throughout the South-West Algerian territory. It lives in extreme climatic conditions, with temperatures ranging from -8°C to 50°C. These colonies are sparsely populated. in contrast with *Apis mellifera intermissa*, it is known as moderately incline to swarming, a weak defensive behaviour and little propolis use and yellowish color

MATERIALS-METHODS

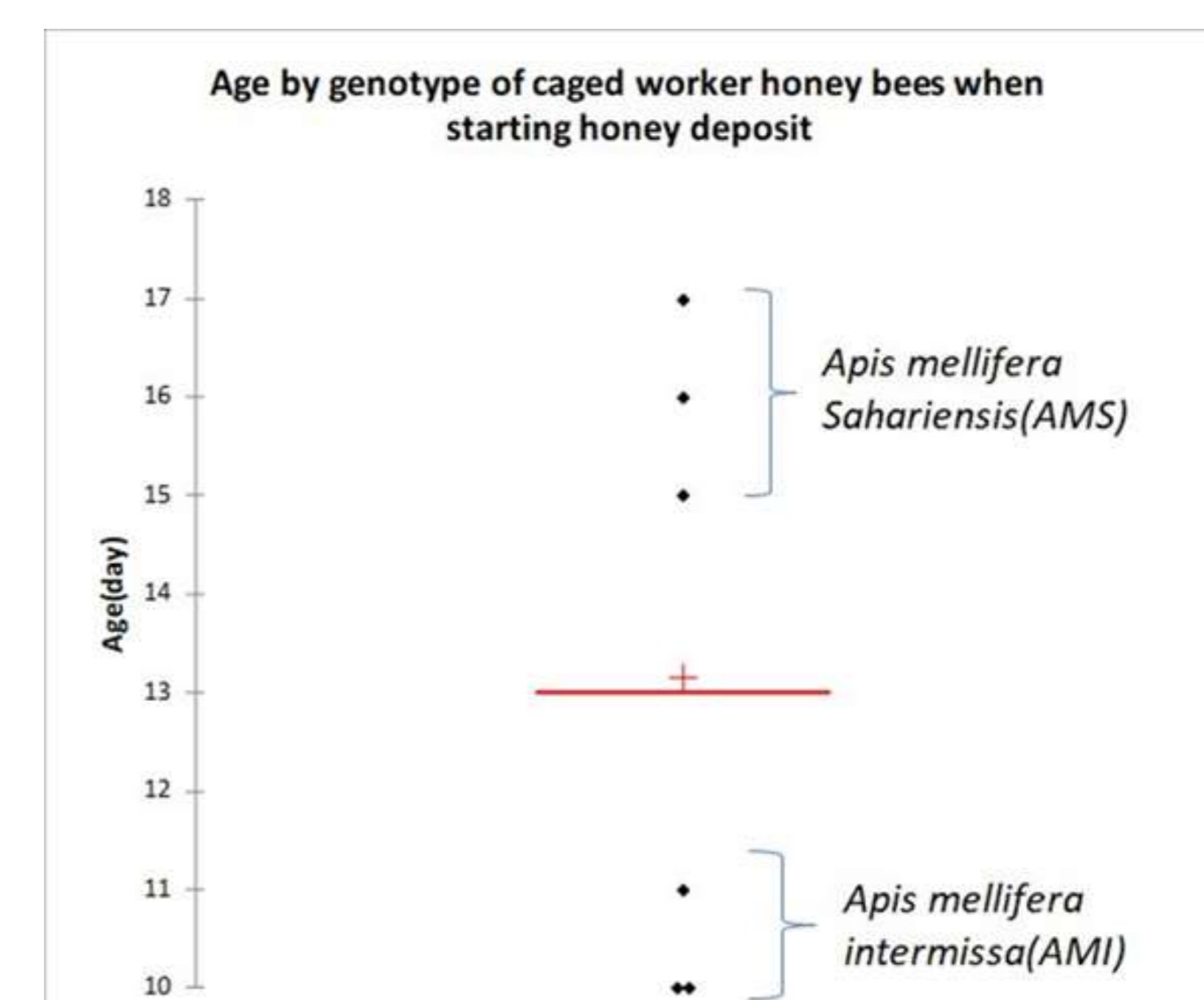
We aimed at the comparison in laboratory cages, the hoarding capacity and honey production of "*Apis mellifera intermissa*" (AMI) and "*Apis mellifera sahariensis*"(AMS) two endemic honey bee subspecies from contrasted climatic conditions. The experiment was carried out during the period April-May of the 2021. Bees of both subspecies were collected from colonies in experimental apiary. One capped brood frame for each breed was incubated at 34-35°C and at 70% RH. Emerging workers were transferred within 24 hours in a 12 × 10 × 4 cm cages endowed with transparent and removable sides and ventilation holes. Each cage had two gravity feeders containing a syrup consisting of sucrose solution (50% w/w) and water respectively as well as open surface feeder on the floor containing a pollen paste. Was added to each cage a piece of comb of known dimension and weight. Cages were maintained in 35°C incubator at 50% humidity. Consumption of syrup was recorded daily and the final honey storage capacity of each subspecies was estimated by subtracting initial and final weight of each piece of comb.

RESULTS

Results indicate that the onset of honey deposition in the wax cells started after 10 and 16 days for AMI and AMS respectively. AMS consumed more syrup than AMI: 32.12±3.34ml against 28.44±2.35ml. During a period of 14 days, AMS stored 16.20±1.88g of honey, averaging 22 mg/bee/day. Whereas AMI stored during a period of 20 days, 14.27±1.44g of honey, with an average of 14.2 mg/bee/day. Our result indicates that under laboratory conditions production of honey was similar ($F < 0.231$) for both subspecies, whereas the hoarding capacity was more important for AMI than AMS ($F < 0.491$). The most interesting observation is that AMS with five days delay in the onset of honey production ($F < 0.001$) has eventually yielded the same honey quantity than AMI.



In general, genotypic difference between *apis mellifera intermissa* (AMI) and *apis mellifera sahariensis* (AMS) didn't explain the variability in sucrose solution daily consumption by worker bees ($F < 0.224$), neither it explained the differences in the overall (30 days) cumulative consumption ($F < 0.562$). However, it was significant before the age 10±0.6 days ($F < 0.005$) when AMI started honey deposit and age 16±1 days ($F < 0.005$) when AMS begin honey deposit. From age 1 to 15 days; AMI consumed respectively 31.7% more sucrose solution than AMS. The analysis of observation from Age 16 to 30 days indicates day highly significant difference ($F < 0.0001$, n=124) where AMS consumed in average 129.5% more than AMI



There is highly significant variability ($F < 0.001$) of the honey production starting day. AMI in all replications started honey deposit in wax cells earlier than AMS at an average age of 10±0.6 days whereas AMS delayed the onset of honey deposit until an average of 16±1 days. consequently honey production period was shorter concerning AMS comparing to AMI with 14 and 20 days respectively but in term of efficiency (mg of honey /bee/day) AMS, was more efficient than AMI with an average of 22 mg/bee/day against 14.2 mg/bee/day.

CONCLUSIONS

The objective of this study is to document an in-vitro comparative analysis of the honey storage capacity of two local honey bees subspecies originating from two very contrasting natural habitats and evaluate if genotypic difference can determine differences in the hoarding behavior and honey production capacity and efficiency of both subspecies. Our preliminary results suggest that under the same controlled conditions the two subspecies produced the same amount of honey and had the same hoarding behavior, whereas the genotypic differences between the two honey bees subspecies seem in great measure explain the differences in the precocity in the age at which the honey production started.