

Biochemical and behavioral analysis of *Ceratitis capitata* at the final step of morphogenesis: imago emergence and wing maturation.



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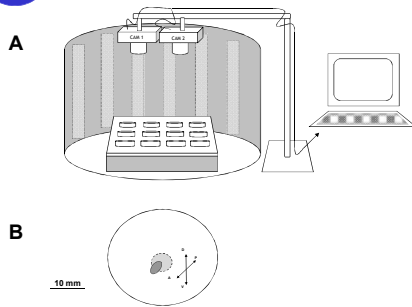
The final step in morphogenesis of the adult fly is the acquisition of the definitive body shape and the wing maturation.

Newly eclosed flies have wings that are highly folded and compact.

We focused our interest in the extrication behavior, the acquisition of the final body shape and wing maturation of *Ceratitis capitata*. These were correlated with behavioral performance with few metabolic parameters as well as with the sclerotization machinery.

To be able to analyze in detail a significant number of flies and parameters, a novel imaging recording system were set up.

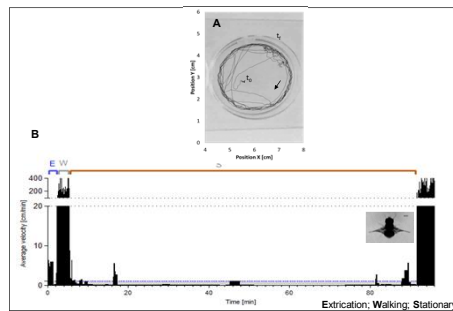
1 EXPERIMENTAL SETUP



Wild-type *C. capitata* adults were reared in a chamber, at $23 \pm 1^\circ\text{C}$, 50–60% relative humidity, with a photoperiod of 16:8 h light: dark cycle.

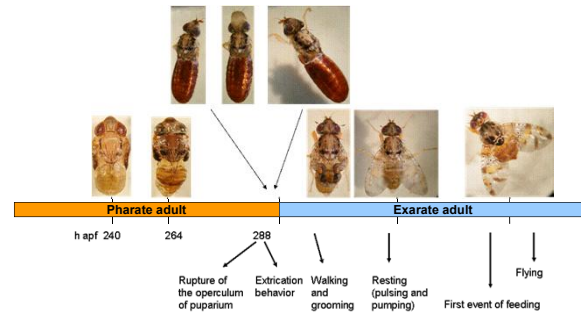
A- Scheme of the film system and scenario. Flies were recorded using two cameras (day and night). Each camera recorded simultaneously twelve arenas. B- In each arena a pharate adult of 264 h was glued in the center.

2 POST- ECLOSION BEHAVIOR



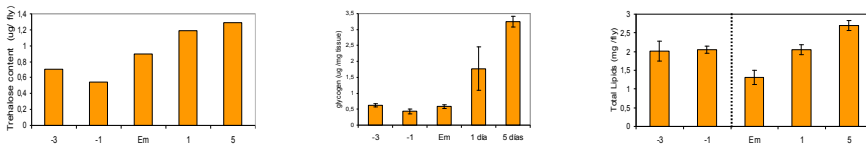
Example of behavioral patterns registered in petri-dish arenas. (A) Record of fly pathways, starting at extrication point (T0) and ending when the ultimate size and shape of the adult was attained (Tf). (B) Diagram of *C. capitata* adult locomotor activity during the extrication (E) and the walking phase (W) and the motionless phase (S).

3 ADULT EMERGENCE EVENTS



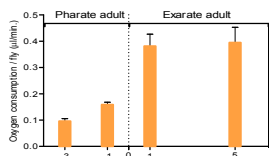
Time duration displayed by *C. capitata* during ecdysis and post-emergence period. WSP%: percentage of wing spreading period.

4 ENERGETIC RESERVES DURING LATE PHARATE AND EXARATE ADULT

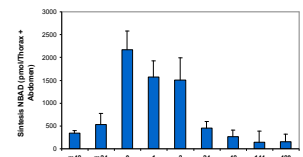
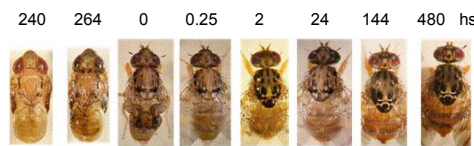
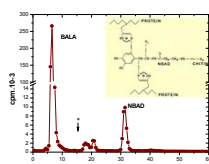


| <i>C. capitata</i> | WSP % |
|--|-------|
| Extrication behavior | - |
| Post-emergence behavior | |
| 1- Walking phase | 6.2 |
| 2- Motionless phase: Wing expansion Wing tanning | 93.8 |
| Total time (Extrication + Post-emergence) | 100 |

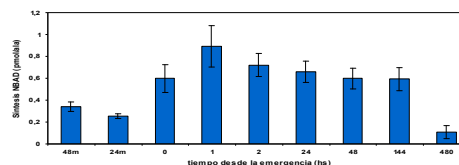
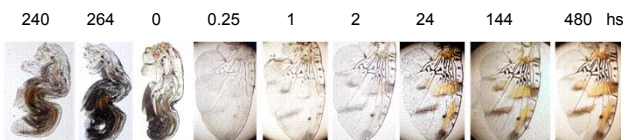
OXYGEN CONSUMPTION DURING LATE PHARATE AND EXARATE ADULT



5 NBAD SYNTHASE ACTIVITY IN THORAX AND ABDOMEN OF *C. capitata*



6 NBAD SYNTHASE ACTIVITY IN WINGS OF *C. capitata*



7 CONCLUSIONS

- We identified two clearly defined periods just after ecdysis where the fly acquires the final body shape and expands the wings. These periods were denominated: walking period and motionless periods.
- During the motionless period occurs the expansion, the sclerotization and the tannification of the wings. After which, the imago is able to fly.
- The oxygen consumption in just emerged exarate adult of *C. capitata*, was four fold higher with respect to pharate adult.
- A rapid recovery of glycogen and lipid reserves occur immediately after emergence and were associated with an important increase in the metabolic rate.
- In thorax and abdomen the maximal N-B-alanyldopamine synthesis was observed during the first two hours after the imago emergence and then decreased to scarce levels.
- Strikingly, N-B-alanyldopamine synthase activity in wings remained high from the emergence until the 6th day.
- The correlation of behavior with final sclerotization of wings is reported here for the first time.