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Physiological development of *Monochamus galloprovincialis* immature adults through shoot feeding

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ABSTRACT

Adult shoot feeding is a vital feature of *Monochamus* life history playing a key role in the pine wilt disease infection cycle. After emergence, adults must feed on the phloem of healthy pine shoots thorough all their life for nutrition to sex mature, disperse, reproduce and survive. Furthermore, it is known to be required by some species as a necessary step for wing muscle development. Development of several physiological parameters and sexual maturation was studied on freshly emerged adults of the pine nematode vector *M. galloprovincialis* (Olivier, Col.: Cerambycidae) during one month of shoot feeding with the aim to gain knowledge on its dispersal behaviour.

Gonadic development was assessed on adults of both sexes ($n=24$) at 0, 4, 8, 14, 18 and >18 day age intervals. Genitalia dissections served to track morphological changes during gonadic maturation as well as the presence of eggs or oocytes. Sex maturation could be established to occur after feeding for 8-14 days in males and 16 days in females.

Fat bodies of fed adults of both sexes ($n=90$) at previously mentioned age intervals were extracted as described by Anderbrandt (1988). *M. galloprovincialis* adults emerged with lipid content averaging 12.28% of their dry weight. This amount was decreasing during the first 4 days down to 9.7%, and then increasing to peak 14 days after feeding at 13.68% of their dry weight (Figure 1).

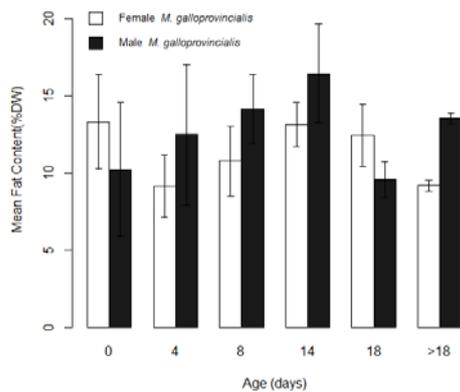


Figure 1: Histogram of mean fat content (%DW)

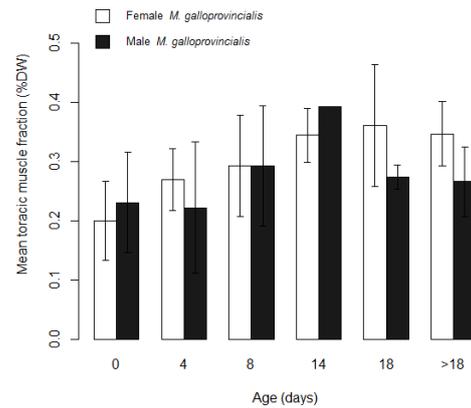


Figure 2: Histogram of mean toracic muscle fraction (%DW)

Up to 60 insects used in lipid extraction had their wing segment extracted and macerated in KOH. The dry weight difference between lipid-less and digested segments, i. e. without muscle, allowed the determination of an approximated muscle content. Results varied from 26.6% of dry weight in males and 20% in females after emergence, to a maximum of 39% in males and 36% in females after 14-18 days of shoot feeding. Steady weight gain was recorded in fed adults through the first 16 days of feeding then before stabilizing. Conversely, weight loss of unfed adults mirrored gain weight of fed adults (Figure 2).

Finally, 29 individuals were fed with *Pinus pinaster* twigs until weight stabilization and 10 unfed insects were kept until death occurred. Survival of unfed adults averaged 12 days and for a maximum of 20 days. Weight loss at the time of death of these beetles was 38% of dry weight.

These results show that freshly emerged, unfed, *Monochamus* adults have fat content and wing muscles enough to undertake sustained dispersal flight.

Key Words:

Bursaphelenchus xylophilus, pine wood nematode, gonads, fat content, wing muscles.

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