

Influence of feed pre-treatment on the proximal composition and fatty acid profile of *Tenebrio molitor*

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INTRODUCTION

In recent years insects have attracted attention for their use as an alternative protein source.¹ They have advantages over traditional protein sources (figure 1).² *Tenebrio molitor* (Coleoptera) is one of the seven species approved by European Union for its use as food and feed.³ Fishery discards are those fish that are thrown overboard due to different causes, mainly of economic, legal and technical origin, this discards represent 10% of the total catches in fishery industries.⁴ These discards are a rich source of valuable proteins and *n*-3 polyunsaturated fatty acids especially eicosapentaenoic acid (20:5 n 3, EPA) and docosahexaenoic acid (22:6 n 3, DHA). These fatty acids are not present in terrestrial insects.⁵ *T. molitor* larva is an omnivorous specie that is mainly fed by cereals or flour.⁶ This study has focused on the pre-treatment of discarded fish prior to use it as feed for *T. molitor* to improve its quality as food and feed.

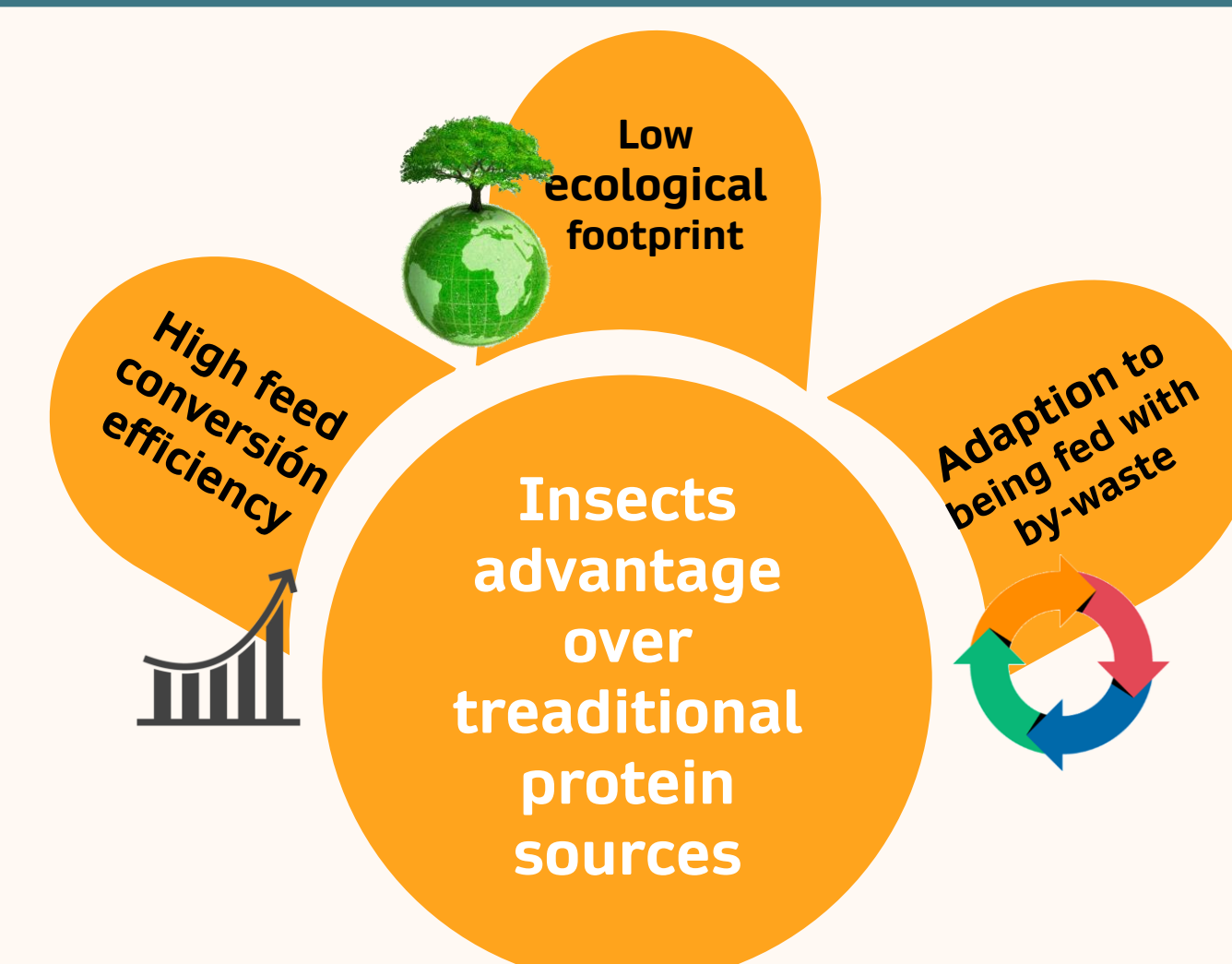


Figure 1. Advantages of insects over traditional protein sources

RESULTS AND DISCUSSION

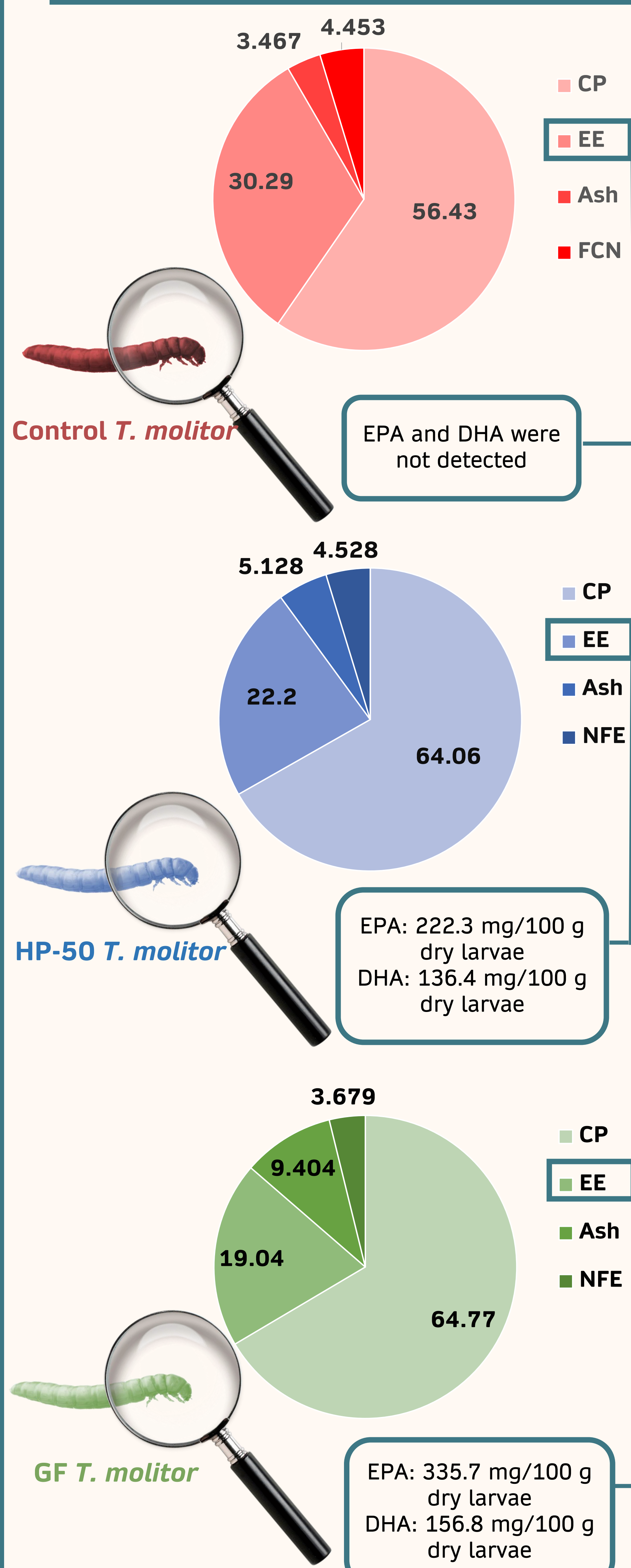
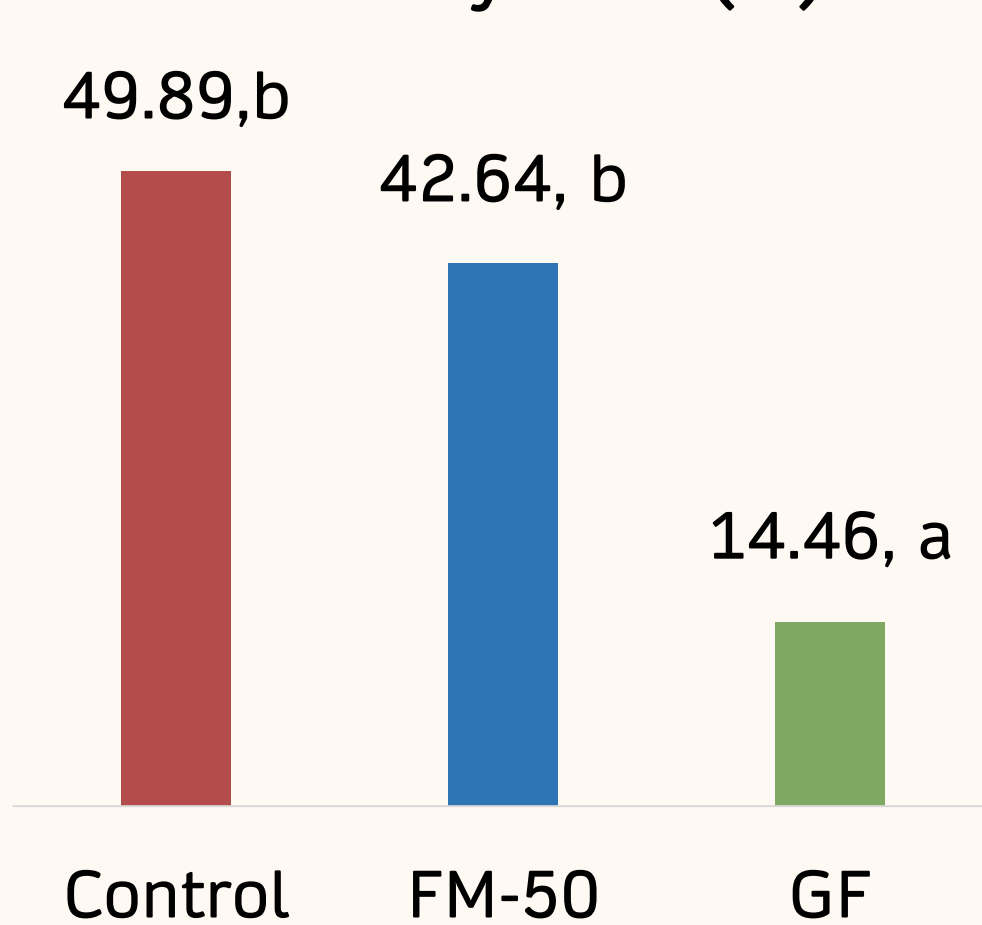


Figure 4. Proximate composition (%) and content of EPA and DHA of *T. molitor* fed with experimental diets. Crude protein (CP), ether extract (EE), nitrogen-free extract (NFE).

Mortality rate (%) a



Final body weight (mg) b

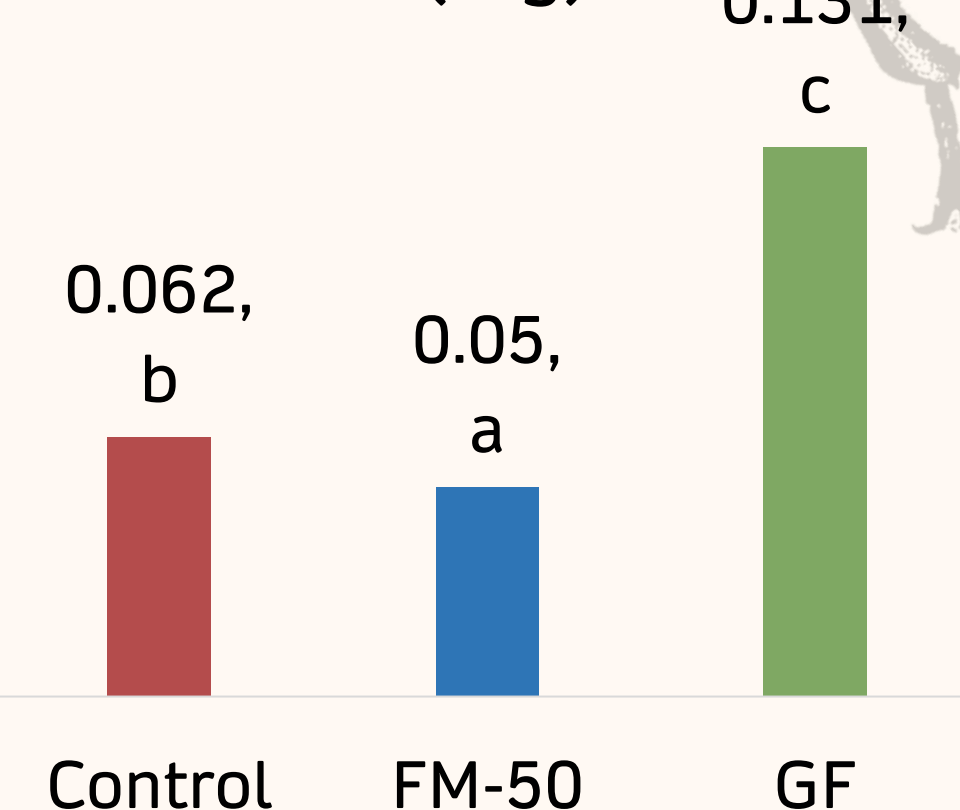


Figure 3. Mortality rate (a) and final body weight of individual larva (b).

Figure 3 and figure 4 display a different feed intake behavior of larvae fed with control and FM-50 diets regarding to GF-fed larvae. Larvae fed with GF diet doubled their final body weight respect to the initial weight, while larvae fed with control and FM-50 diet kept or decreased their final body weight. This is a result of low feed intake, resulting in consumption of fat reserve.⁹ Higher levels of crude protein in larvae fed with fish-based diet are expected due to higher protein levels in those diets regarding to the control diet. Regarding fatty acid profile of larvae fed with fish-based diets, EPA and DHA increased in GF-fed larvae up to 335.7 mg/100 g of dry larvae and 156.8 mg/100 g dry larvae, respectively. The amount of EPA was higher for GF-fed larvae, meanwhile the levels of DHA were similar in both larvae fed with fish-based diets. DHA does not has the same tendency to accumulate in insects as EPA. Pre-treatment demonstrated to be an effective way to feed *T. molitor* with fish-based diets. It allows to take advantage of fishery discards when there is no possibility of their use for fishmeal preparation.

EXPERIMENTAL DESIGN

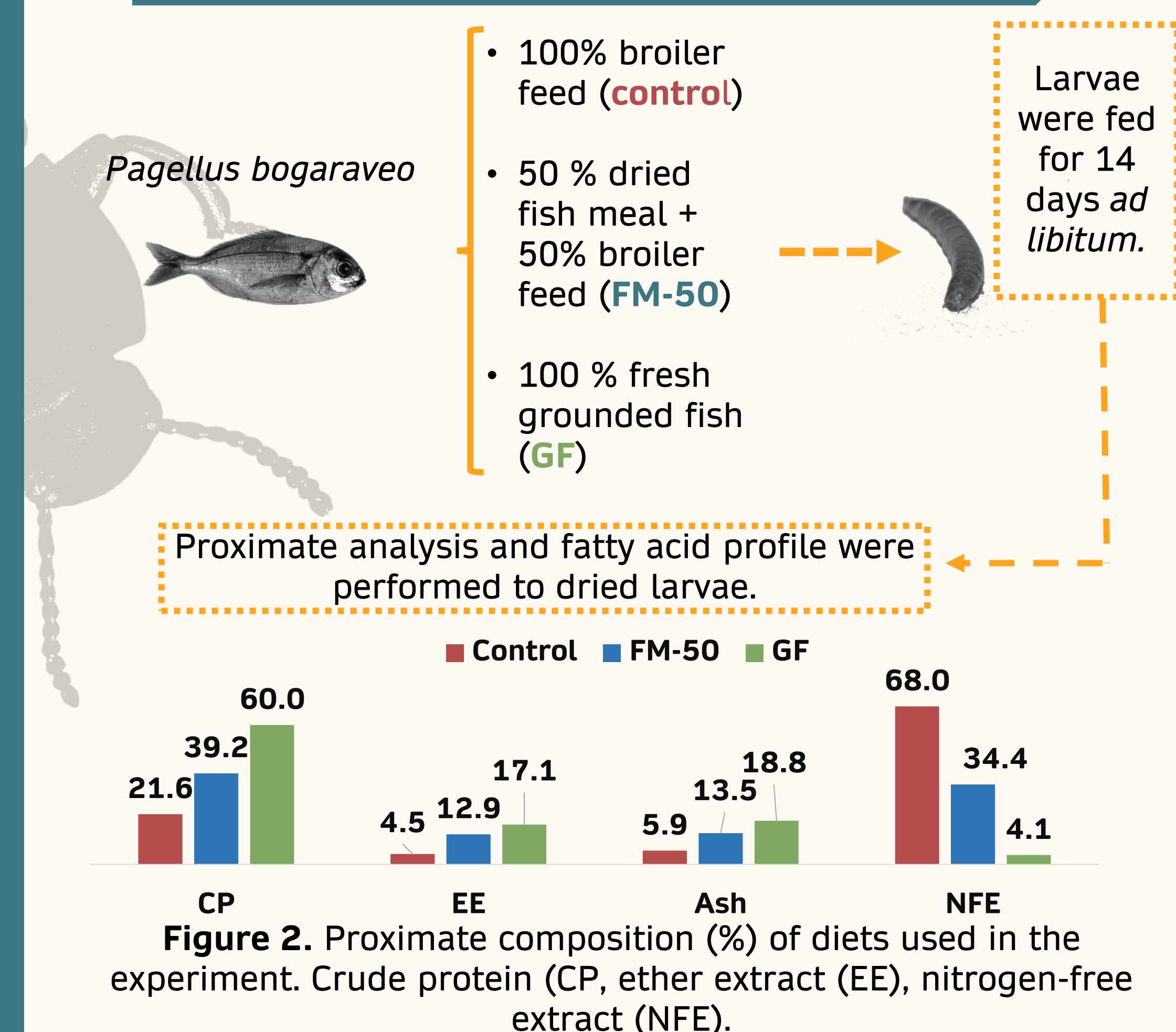


Figure 2. Proximate composition (%) of diets used in the experiment. Crude protein (CP), ether extract (EE), nitrogen-free extract (NFE).

T. molitor were reared at the laboratories of University of Almería, initial weight of individual larva was 0.066 g. The experiment was performed at 26±1°C and 65±5% humidity. Control and FM-50 diets were mixed with distilled water (70:30, feed:distilled water). GF diet were prepared by a commercial mixer and frozen until feeding the larvae. Three different boxes (15 x 20 cm) were used per treatment. Fatty acid profile was measured by Barroso et al., (2019)⁷ method. Proximate analysis were performed using the AOCS method.⁸

CONCLUSIONS

- Pre-treatment has proven to be an effective method for feeding *T. molitor* with discarded fish.
- Fresh discarded fish (GF) displayed better results regard to other diets.
- GF-fed larvae displayed higher amounts of EPA than FM-50, although DHA content was similar in both larvae.

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