

Research Article

## Type of cereal flours as factors affecting biological and physiological characteristics of *Ephestia kuehniella* (Lepidoptera: Pyralidae) larvae

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**Abstract:** The Mediterranean flour moth, *Ephestia kuehniella* Zeller is one of the conventional hosts for rearing of natural enemies to be used in biological control programs. In this study, the effects of three cereal flours (wheat, corn and barley) on some biological parameters, nutritional responses, as well as proteolytic and amylolytic digestive activities of the fifth instar larvae of *E. kuehniella* were studied to determine suitability of the cereals for optimum growth and reproduction of *E. kuehniella*. The highest rate of larval survival (0.88) and larval growth index (9.77) were obtained in larvae which fed on corn flour. The relative growth rate ( $9.17 \pm 0.33$  mg/mg/day) and the efficiency of conversion of ingested food ( $12.08 \pm 1.11\%$ ) were the highest rate for fifth instar larvae which fed on corn flour. The highest protein concentration in midgut of larvae ( $63.77 \pm 2.31$  mg/ml) and consequentially, proteolytic activity including tryptic ( $0.0012 \pm 0.00$  Umg<sup>-1</sup>) and chymotryptic ( $0.543 \pm 0.001$  Umg<sup>-1</sup>) were observed in larvae that fed on corn flour. According to the results obtained, corn (Var. 704) was the most suitable cereal for laboratory rearing of *E. kuehniella*, resulting in the highest rate of biological and physiological parameters.

**Keywords:** Mediterranean flour moth, cereal, nutritional indices, proteolytic and amylolytic activity

### Introduction

The Mediterranean flour moth, *Ephestia kuehniella* Zeller, is one of the important stored products pests, which is found on grains, particularly powdered cereal products (Cox and Bell, 1991; Hill, 2002; Rees, 2004; Tarlack *et al.*, 2015). The powdered food is preferred over the whole grains although they can feed on the whole grains too. *E. kuehniella* is not only known as an important pest, but also, the eggs and larvae of this species are

widely used as a conventional host for the mass rearing of several parasitoids such as Braconidae and Trichogrammatidae (Hoffmann *et al.*, 2001; Shonouda and Nasr, 1998) as well as, predators including *Adalia bipunctata* (L.) (Col.: Coccinellidae) (Shonouda and Nasr, 1998; Specty *et al.*, 2003), *Harmonia axyridis* Pallas (Col.: Coccinellidae) (De Clercq *et al.*, 2005), *Orius albidipennis* Reuter (Hem.:Anthocoridae) (González-Zamora *et al.*, 2007), *Franklinothrips orizabensis* Johansen (Thys.: Aeolothripidae) (Hoddle *et al.* 2001) and *Chrysoperla carnea* (Steph.) (Neu.: Chrysopidae) (Jokar and Zarabi, 2012).

Due to the fundamental importance of host plant quality on tri-trophic nutritional system (e.g.

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