

A Environmental Friendly Insect is *Tenebrio molitor* (Tenebrionidae: Coleoptera)

Engin KILIÇ

Erzincan University, Faculty of Pharmacy, Department of Basic Pharmacy Sciences.

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Abstract: *Tenebrio molitor* is a species of darkling beetle (Tenebrionidae: Coleoptera), which produces larvae that are commonly called mealworms. Acting as decomposers in the natural environment, they feed on decaying plant materials and dead insects. As a result of its easy handling and non-fastidious culture conditions, *T. molitor* is used as a pet food, an educational material, and as a biological research model. As a result, we reported that, 20 larvae of *T. molitor* eat 1g, at first box, others respectively 2g, 2g, and 1g. They eat 0.014g at first box and others respectively 0.028g, 0.028g and 0.014g a day. According to our result of our study, we can use this insect as a styrofoam degradation.

Key words: *Tenebrio molitor*, styrofoam degradation, environment, alternative

1. Introduction

Polystyrene (PS) is a *polymer*. It is made of a long chain of repeating groups of atoms. The chemical structure of those units makes it very stable and long lasting. PS is very slow to biodegrade and is therefore a focus of controversy among environmentalists. It is increasingly abundant as a form of litter in the outdoor environment, particularly along shores and waterways, especially in its foam form, and also in increasing quantities in the Pacific Ocean. (Kwon, BG; et al. (2014). PS is generally considered to be durable and resistant to biodegradation. Mealworms (the larvae of *Tenebrio molitor*) from different sources chew and eat Styrofoam, a common PS product. The Styrofoam was efficiently degraded in the larval gut within a retention time of less than 24 h. Fed with Styrofoam as the sole diet, the larvae lived as well as those fed with a normal diet (bran) over a period of 1 month (Yu Yang et al., 2015). In this study, we conducted an experiment about *T. molitor* which eats styrofoam during 10 weeks. For learning how much gram does a larva eat styrofoam during 70 days.

Corresponding author: Engin KILIÇ, Erzincan University, Faculty of Pharmacy, Department of Basic Pharmacy Sciences.

2. Materials and Methods

1. *Tenebrio molitor* production

Tenebrio molitor, a species of darkling beetle. Like all holometabolic insects, they go through four life stages: egg, larva, pupa, and adult. We used the **oat** (*Avena sativa*) as a food for feeding *T. molitor* larva and adult. While oats are suitable for human consumption as oatmeal and rolled oats, one of the most common uses is as livestock feed (Zimmerman, 1986). The mealworm beetle breeds prolifically. Mating is a three-step process: the male chasing the female, mounting her and inserting his aedeagus, and injecting a sperm packet. Within a few days the female burrows into soft ground and lays about 500 eggs. *T. molitor* life cycle is Table.1.

Table.1. Life cycle of *T. molitor*

Life Stages	Time (Day)
Egg	4-19
Larva	70
Pupa	6-18
Adult	56-84

2. Test methods

We firstly put 7g styrofoam and 20 larvae of *T. molitor* in every plastic boxes. Our larvae stage is start first larvae. We observed 70 days after that we measured all styrofoam.

3. We use a bar of styrofoam for biodegradation at our experiment. We established 4 application and made of styrofoam.

3. Conclusions

As a result of our experiment, We firstly put 7g styrofoam and 20 larvae of *T. molitor* in every plastic boxes. Our larvae stage is start first larvae. We observed 70 days after that we measured all styrofoam and as we can see our result; first box we can see the number of larvae are 17 after 70 days, others boxes respectively 20 larvae, 19 larvae, 17 larvae. We measured the weight of styrofoam respectively 6g, 5g, 5g, and 6g (Table.2; Figure 1, 2, 3, 4, 5).

Table.2. Before application and after application after 70 days

	Number of larvae in application	Number of larvae after application	Styrofoam weight in application (g)	Styrofoam weight after application (g)
1	20	17	7	6
2	20	20	7	5
3	20	19	7	5
4	20	17	7	6



Figure 1. I measured the weight of styrofoam (g)



Figure 2. I put in box every styrofoam and add *T. molitor* larvae (every box included 20 larvae). Application Time (10.08.2016)

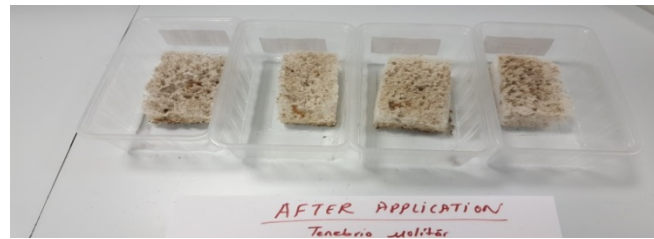


Figure 3. We counted number of larvae and styrofoam weight (g) after 70 days



Figure 4. I measured the weight of styrofoam (g) after 70 days



Figure 5. Larvae eat styrofoam and made a galeri into styrofoam

As we can see, 20 larvae of *T. molitor* eat 1g, at first box others respectively 2g, 2g, and 1g. They eat 0.014g at first box and others respectively 0,028g, 0,028g and 0.014g a day. Yu Yang et al., (2015) reported that 100 larvae of *T. molitor* eat 34-39mg or (0.034g-0,039g) styrofoam a day. Our result similar to this result.

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