Plastic Consumption by Mealworms

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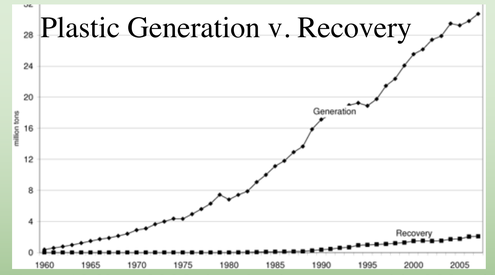
Problem: Plastic Waste

Humans are increasing plastic usage

Modern plastic disposal is inefficient and hazardous (landfills, incineration, liquefaction)

Plastics are estimated to take 1,000-100,000 years to biodegrade in nature

Chemical structure of plastics and additives prevent degradation



From 1960 to 2008 the plastic generated is 822 million pounds more than the plastic recycled.

Solution: Mealworms

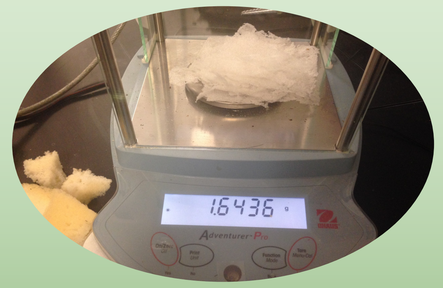
Mealworm (*Tenebrio molitor* Linneaus) gut bacteria has been proved to biodegrade the plastic polystyrene (PS) according to a Stanford publication done by Dr. Wei-Min Wu.

Question: Which plastic type is best suited for mealworm survival?

Methodologies

Three different types of plastics are tested: polyurethane (PUR), polyvinyl chloride (PVC), and polyethylene (PET). For each plastic type there are two trials with 50 mealworms each.

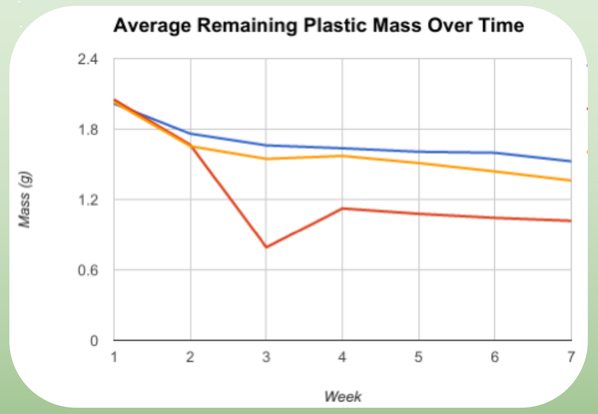
1. Mealworms consume plastic and produce fecula



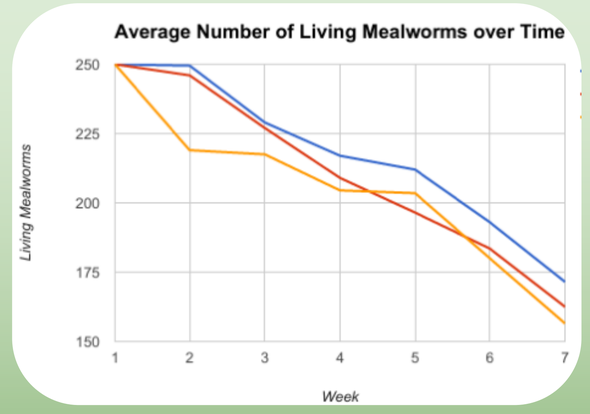
2. Data is collected: plastic mass, number of alive and dead mealworms

Results

Figure 1



Loss of plastic mass as larvae of *Tenebrio molitor* Linneaus chew and consume plastics

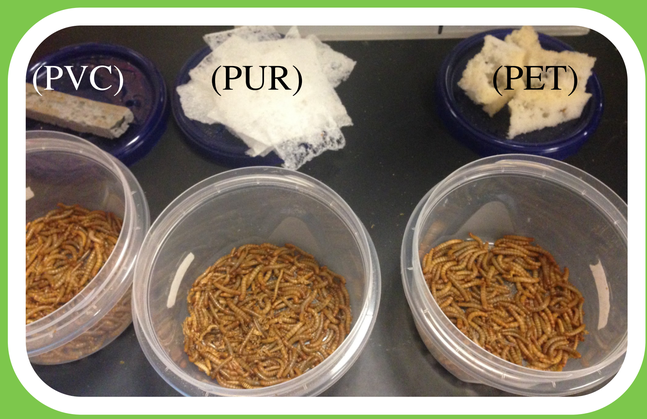


Number of living *Tenebrio molitor* Linneaus for different plastics every 2 weeks.

Conclusion

Polyurethane is plastic best suited for mealworm survival:

- ❖ Highest percent consumed mass 50.36% (Fig. 1)
  - ➢ Determined by dividing remaining mass from original mass
    - ■ PVC: 32.85% mass consumed
    - ■ PET: 24.36% mass consumed
- ❖ Fastest rate of plastic consumption 7.15 mg consumed/ mealworm/week
  - ➢ Standard Deviation σ = .00104
    - ■ PVC: 3.61 mg/ week
    - ■ PET: 5.16 mg/week
- ❖ Highest percent (76.4%) of original population remaining (Fig. 2)
  - ■ PVC: 62.6% original population
  - ■ PET: 64.8% original population



Trials of Polyvinyl Chloride, Polyurethane and Polyethylene Plastic

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