THE EFFECT OF WASTE FOOD DIETS ON THE YELLOW MEALWORM LARVAE (TENEBRIO MOLITOR)

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ABSTRACT

- · The world population is projected to grow to 9.8 billion by the year 2050 (1)
- Currently, 37.5% of arable land on Earth is used to feed livestock (2)
- Using pesticides, fertilizers and animal waste for crop maintenance of leads to land and water degradation (3)
- Globally, agriculture produces to one-third of methane emissions, 5.25 billion tons of carbon dioxide and 60% of nitrous oxide emissions (3)

We need an alternative protein source that can sustain people and livestock while producing significantly less greenhouse gases!

FUNDING/SUPPORT

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support. Their waste food donations to this

WHY MEALWORMS

Our research on Yellow Mealworm Beetle (Tenebrio molitor) larvae offers a solution to these problems in four ways.

Mealworms...

- take up less space than traditional livestock
- can be fed less expensive & more sustainable diets and have reduced water requirements
- produce significantly less carbon emissions compared to traditional
- have a greater nutritional density than beef

METHODS AND MATERIALS

- Live mealworms were obtained from Wild Birds Unlimited in Surrey, BC
- Each life stage (mealworm larvae, pupae and beetles) were raised in Steralite containers
- All first generation life stages were raised on control diet of oatmeal pellets
- Second generation mealworm larvae were split into three groups of ~1000 worms, with each group being fed a different (Fig 1)
- A variety of metrics were collected every Monday Wednesday and Friday (Table 1)
- Components of each diet were sourced from a variety of locations (Table 2)
- All food items were dehydrated and converted into pellets using potato starch as a binder
- Diets were Control, Waste Food and High Protein/High Starch (Table 3)

COMPOSITION SOURCE **TYPE** Control **Oatmeal** Grocery **Stores** Kitchen Scraps Langara **Organic Bins** College Chartwells Researcher's **Homes** Meat Grocery **Brewer's Spent** Protein Stores Grain **Faculty** Starch Brewing

TABLE 1 – DIET SOURCES

DIET TYPE	COMPOSITION
Control	Oatmeal + Water + Fresh Carrot
Waste Food Diet	Waste Food + Potato Starch + Fresh Carrot
High Protein/High Starch	Meat + Brewers Spent Grain + Potato Starch + Fresh Carrot

TABLE 2 – DIET COMPOSITION

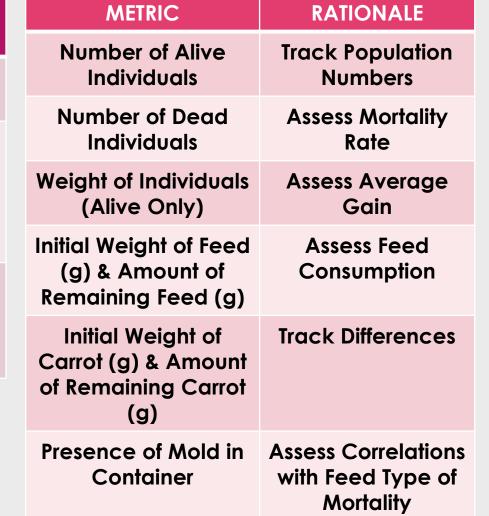


TABLE 3 – DIET SOURCES

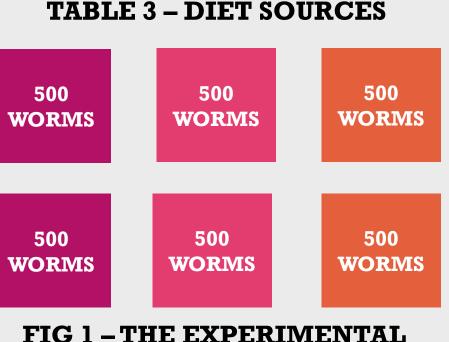


FIG 1 – THE EXPERIMENTAL **SETUP AND DIETS**

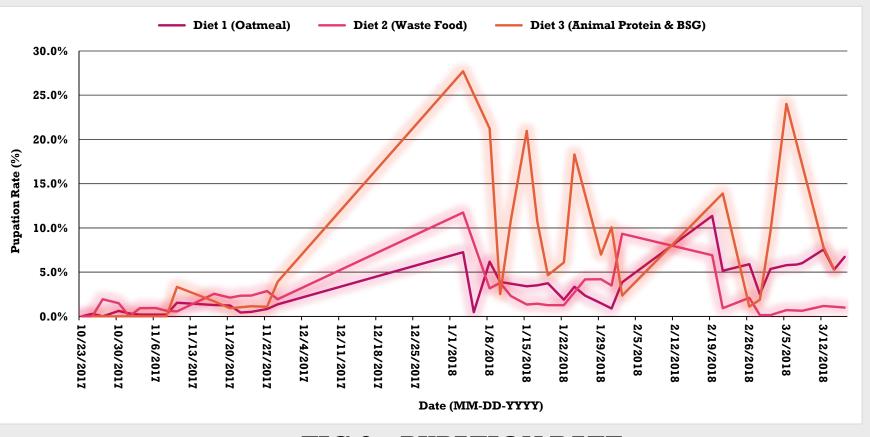


FIG 2 - PUPATION RATE

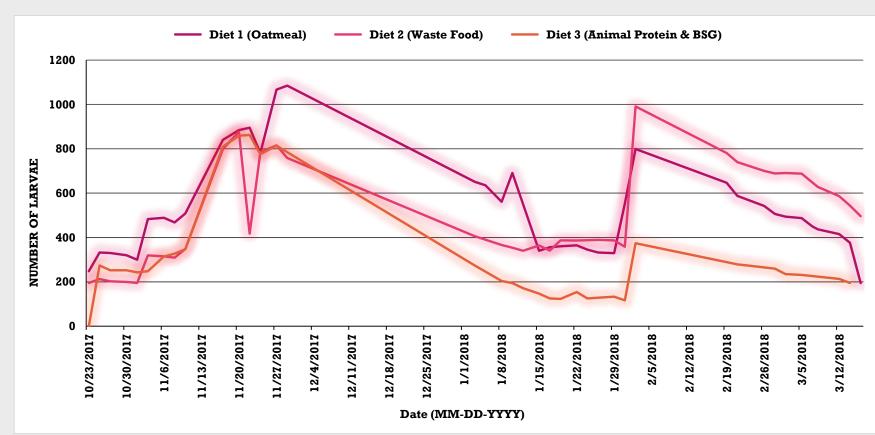


FIG 3 – CHANGE IN LARVAE OVER TIME

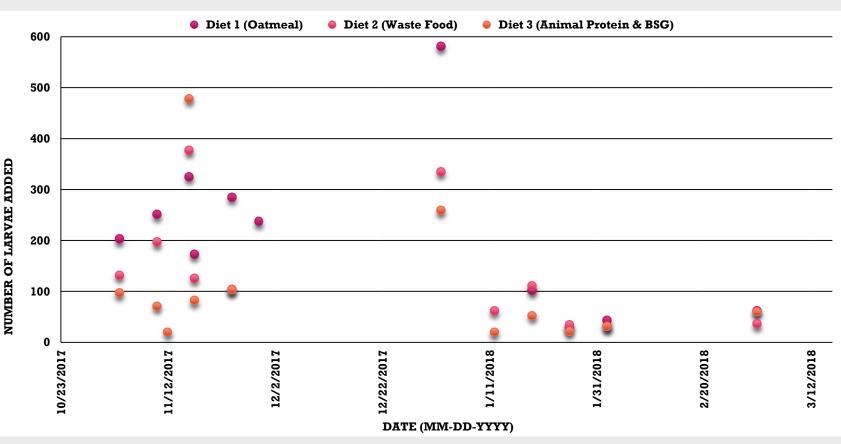


FIG 4 - MEALWORM LARVAE ADDED OVER TIME

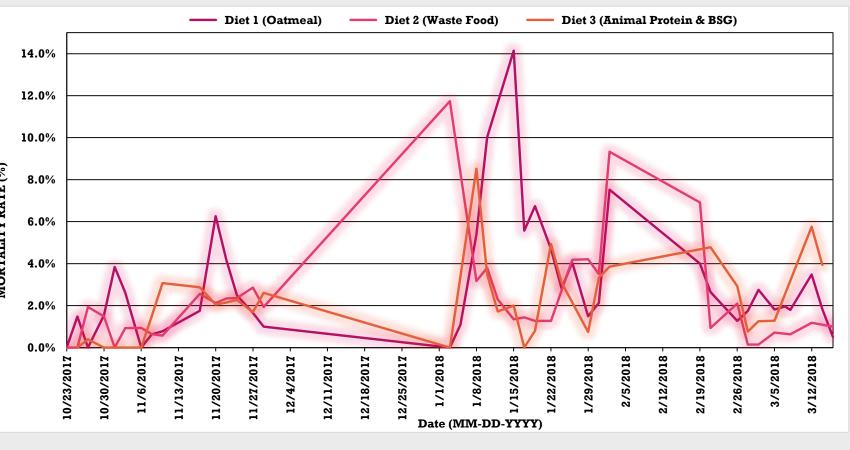


FIG 5 - MORTALITY RATE

RESULTS

- Mealworms on the Control and Waste Food diets had higher population numbers compared to the High Protein/High Starch diet (Fig 2)
- Waste Food and Control diets both had lower average mortality rates $(2.2\% \pm 2.5 \text{ and } 2.2\% \pm 2.0)$ compared to the High Protein/High Starch diet $(3.0 \% \pm 2.9)$ (Fig 3)
- Transition from larvae to pupae (pupation rate) was significantly higher for High Protein/High Starch diet (Fig 4)
- The Waste Food diet produced a lower amount of new larvae compared to the control (Fig 5)

CONCLUSIONS

It is feasible to raise mealworms on a waste food diet. Further study is needed to determine if yellow mealworm larvae can act as an alternative nutrition source for humans

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