The Role of a Seeds Calorific Value on Seed Selection by *Harpalus pensylvanicus*

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**Introduction and Background**

- Weed management with pesticides are costly and deleterious to both human and environmental health.
- An alternative weed management tactic is Integrated Weed Management (IWM).
- Ground-dwelling invertebrates, especially *H. pensylvanicus*, are effective weed seed predators.
- Reduce weed seed stocks by 90% and populations can consume 1000 m³ per year.
- Seed characteristic preferences of *H. pensylvanicus* greatly affect their seed eating rates. But we know very little on how the calorific value of the seed may affect it.

**Research Objectives and Hypothesis**

1. Determine how much of a role a seed’s calorific value plays on the diet choice of *H. pensylvanicus*
2. Examine how rearing in a laboratory setting will affect *H. pensylvanicus* feeding behavior
3. Determine the potential of *H. pensylvanicus* as a targeted biological control agent

Hypothesis: *H. pensylvanicus* will show a behavioral response to the seeds they were reared on when tested for seed preference despite the calorific values of the others seed available to them.

**Materials and Methods**

- Beetle collection
- Feeding trials
  - Three feeding groups: control, giant foxtail & velvetleaf (n=12 or 15), kept on diet for 39 days
- Preference test
  - Arena trials w/ four different seed choices; recorded foraging choices for 10 min
- Seed calorific value determination
  - Determined the seed calorific value of four different weed species using a Parr Plain Jacket Calorimeter (n=5)

**Results**

- There was no significant difference among the death rates in the three feeding groups (One-way ANOVA, p= 0.77).
- There was a significant difference between the seed calorific values of the weed species (One-way ANOVA, p= 0.02).
  - Greatest seed calorific value - ragweed (26.575 kJ/g); lowest seed calorific value – pigweed (21.706 kJ/g)
  - No significant difference between the seeds used in the two experimental feeding groups (p= 0.996)

**Objective 1:** There was no observed correlation between a seeds calorific value and a beetles foraging choice.
- Other seed characteristics may have a greater role in determining *H. pensylvanicus* foraging choice and rate (seed size, seed coat hardness, etc.).

**Objective 2:** Laboratory diet rearing showed trends of affecting *H. pensylvanicus* feeding behavior:
- Previous studies show a 0% preference for velvetleaf seeds by *H. pensylvanicus*. In this study, *H. pensylvanicus* in the velvetleaf feeding group lived off of velvetleaf for over a month and had the lowest mortality rate (42%).
- Objective 3: The potential of *H. pensylvanicus* as a targeted biological control agent requires further investigation.
- Both experimental feeding groups did show trends of preference during the arena trial.

**Discussion**

- Future experiments should look into rearing larva on specific seed diets
- Future experiments should replicate this experiment with higher-quality preference tests i.e. cafeteria studies
- Calculate the calorific values of the other seeds they eat
- Better understand their foraging choices

**References**