

To Adzuki or to Mung... THAT is the question

Jenna Hojnacki, Rachel Fenner,
Sarah Spiro, Tin Tran

Bean Beetle Oviposition

Why is it important?
What determines it?
Bean it emerged from
Surface area

Experiments suggest chemosensory cues on surface of bean that influences oviposition

Control of Surface Area and Ratio

Hudaib et al (2013) suggested control of surface area.

Using the surface area formula of an ellipsoid and Image J, average surface areas of **mung** beans and **adzuki** beans and a ratio were calculated.

Ratios need to be recalculated for each batch of beans.

$$S \approx 4\pi \left(\frac{(ab)^{1.6} + (ac)^{1.6} + (bc)^{1.6}}{3} \right)^{1/1.6}$$

Past Experiments

2012-2014: **mung** vs. **adzuki**

- preference for **adzuki**

Past Experiments

Summer 2014:

- new preference seen for **mung**
- Explanation?
 - New batch of adzuki beans used
- Found chemical difference by GC-MS

GC-MS Comparison

Peak= compound present

Red: New Adzuki
Blue: Old Adzuki

Past Experiments

Fall 2014

Results:

- Beans were preferred over glass beads.
- No preference found when beans were not washed.
- When compounds were removed with acetone, **red** beans were preferred over **mung** beans.

Fall 2015 - Our Purpose

Based on fall 2014 experiment (preference influenced when chemical coats were stripped)...

Suggested that chemical differences between **mung** and **adzuki** determine preference.

Possible chemical repellent in the compounds on the coat on **adzuki**.

What will happen if the compounds are swapped?

Preparation: Extraction

Acetone soluble compounds were removed

Experimental Design

- Treated beans were washed with acetone twice using previous extraction technique
- Each treatment group had 40 replicates

Experimental Design

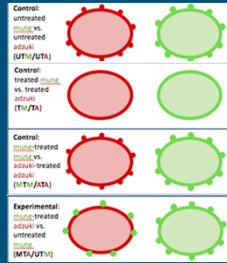
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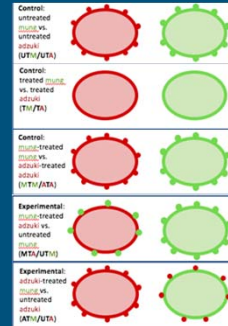
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Preparation: Plating and Incubation

- One female beetle was put into each dish
- After 7 days of incubation, the number of eggs in each dish was counted. The proportion of eggs laid on mung and adzuki beans was then calculated and compared.

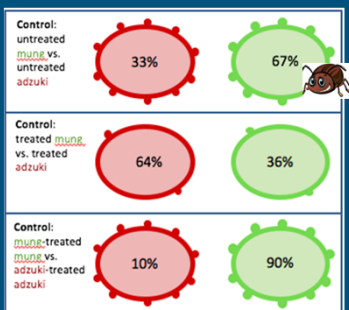


Results



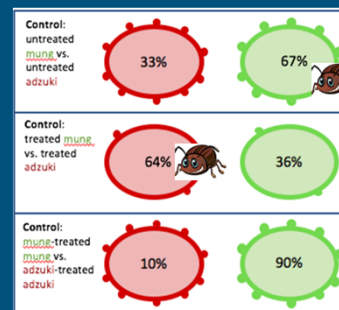
Tukey-Kramer HSD p<0.0001 for all

Results

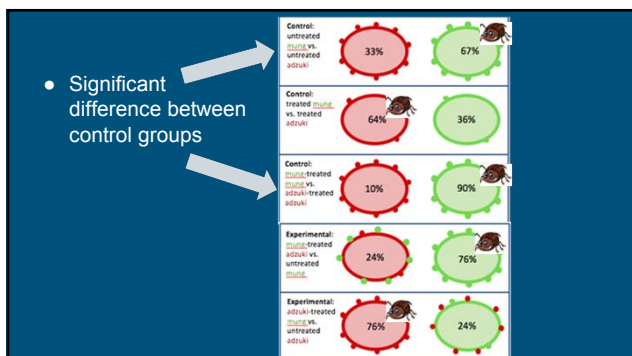
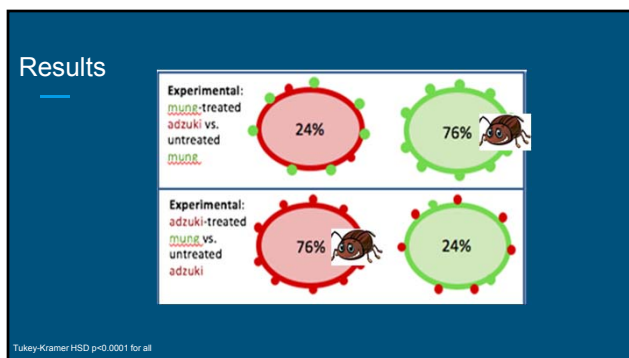
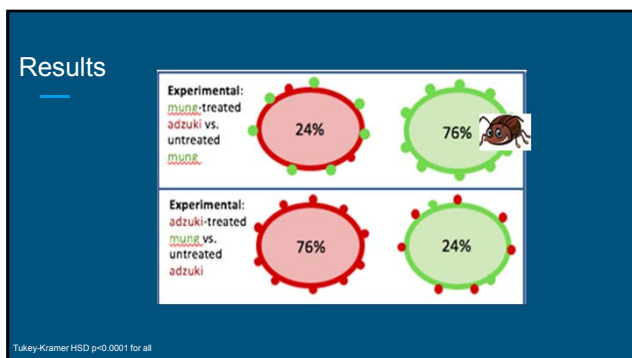
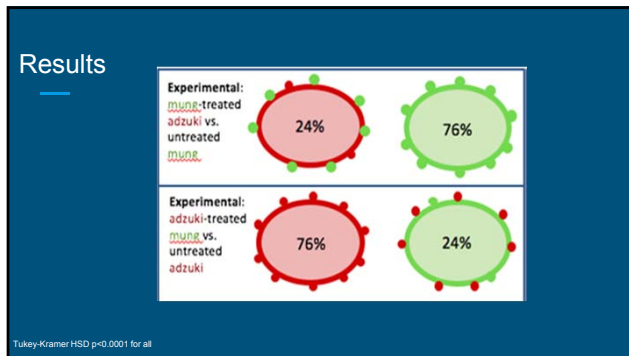
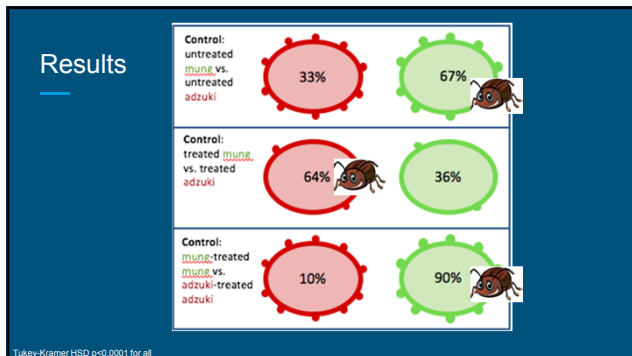


Tukey-Kramer HSD p<0.0001 for all

Results

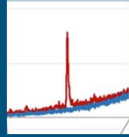


Tukey-Kramer HSD p<0.0001 for all



What's next?

- What specific adzuki compound is the repellent?
 - Squalene?
- Possible inhibitory effects of combining compounds on coats?
- Which correctly controls for bean size difference: surface area or ratio of beans?



Surface Area and Control Group Preference

Ratio	Mung ● or Adzuki ●
52 Mung to 40 Adzuki	Adzuki preference ●
60 Mung to 30 Adzuki	No preference
60 Mung to 22 Adzuki	Mung preference ●

Who cares?

These beans are crops used in many countries.

Bean beetles are pests. Understanding how pests locate and lay their eggs could lead to better pest control, especially when they don't have a 100% oviposition preference.



Acknowledgments

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- Matt Howell
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Thank you!

Questions?