



Bean Beetles Follow in Their Parents Footsteps, or Do They?

Influence of Temperature on Bean Preference of the Bean Beetle, *Callosobruchus maculatus*

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INTRODUCTION

This project seeks to examine the **effects varying temperatures have** on the bean beetles' preference for beans. In this case, mung beans, black-eyed peas (*Vigna unguiculata*), and Adzuki beans (*Vigna angularis*) are used.



The central hypothesis posits that the beetles will prefer to lay eggs on the bean they are native to (in this case the mung bean), even if there are other beans available.

- **Lowest temperature:** there will be less of a preference, since the beetle will preserve energy due to the low metabolism.
- **Highest temperature:** still a preference for the native bean, but a smaller number of eggs, since the high temperature increases the metabolic rate, and the beetles will die faster.

METHODS

For three temperatures - 24°C, 28°C, 32°C - we had three Petri dishes with 25 beans of each type (mung bean, adzuki bean and black-eyed peas), giving a total of 75 beans in each dish. Also we used three dishes with 75 mung beans as a control group. In every dish we had two female beetles and one male beetle. After setting up the experiment, we counted the number of eggs in each petri-dish and switched out any dead individuals for seven days over a 10 day period.

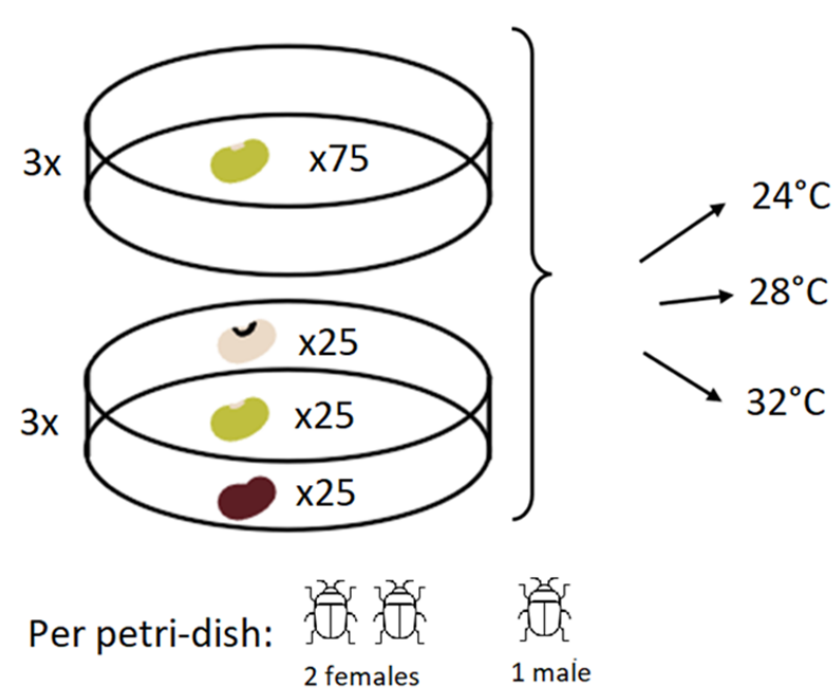


Fig. 1. Visual representation of the experimental set-up. The top Petri dish is the control group and the Petri dish on the bottom is the test group.



Fig. 2. Female *C. maculatus* feeding on Mung bean (*Vigna radiata*) Murdock et.al. (2003) Photograph by Garima Garima.

RESULTS

- The total number of eggs in both the test and control group is largest at 28°C (non-significant)(fig.3).
- At both 28°C and 32°C there is a significant preference for the adzuki bean ($p < 0.0001$)(fig.4).
- At 24°C there is a significant preference for the mung bean ($p < 0.0001$)(fig.4).
- There is a significant non-preference for the black-eyed peas in either scenario (fig.4).

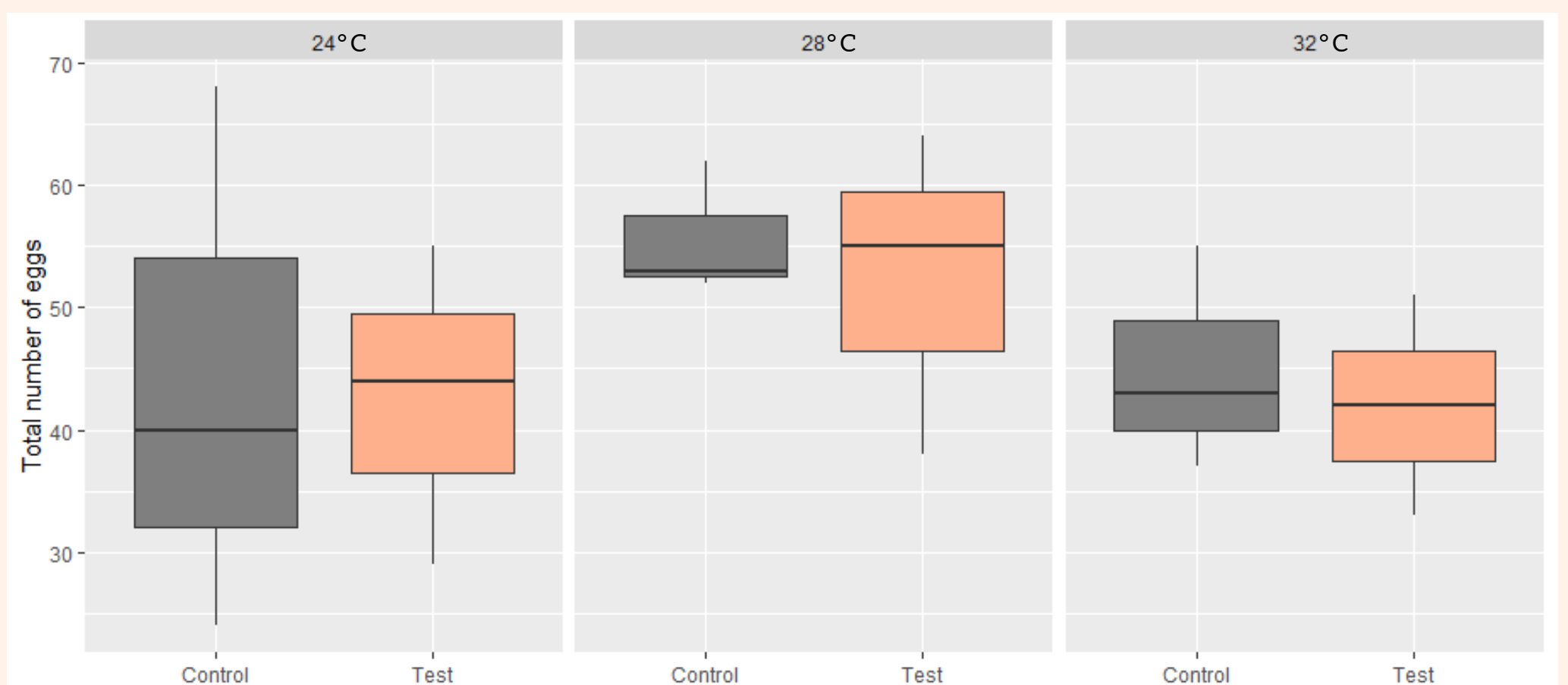


Fig. 3. Boxplot of the total number of eggs for test and control dishes to determine the optimal temperature of the bean beetles. The control groups had the highest number of eggs laid at both 24°C and 32°C, however at 28°C the test groups had the most eggs.

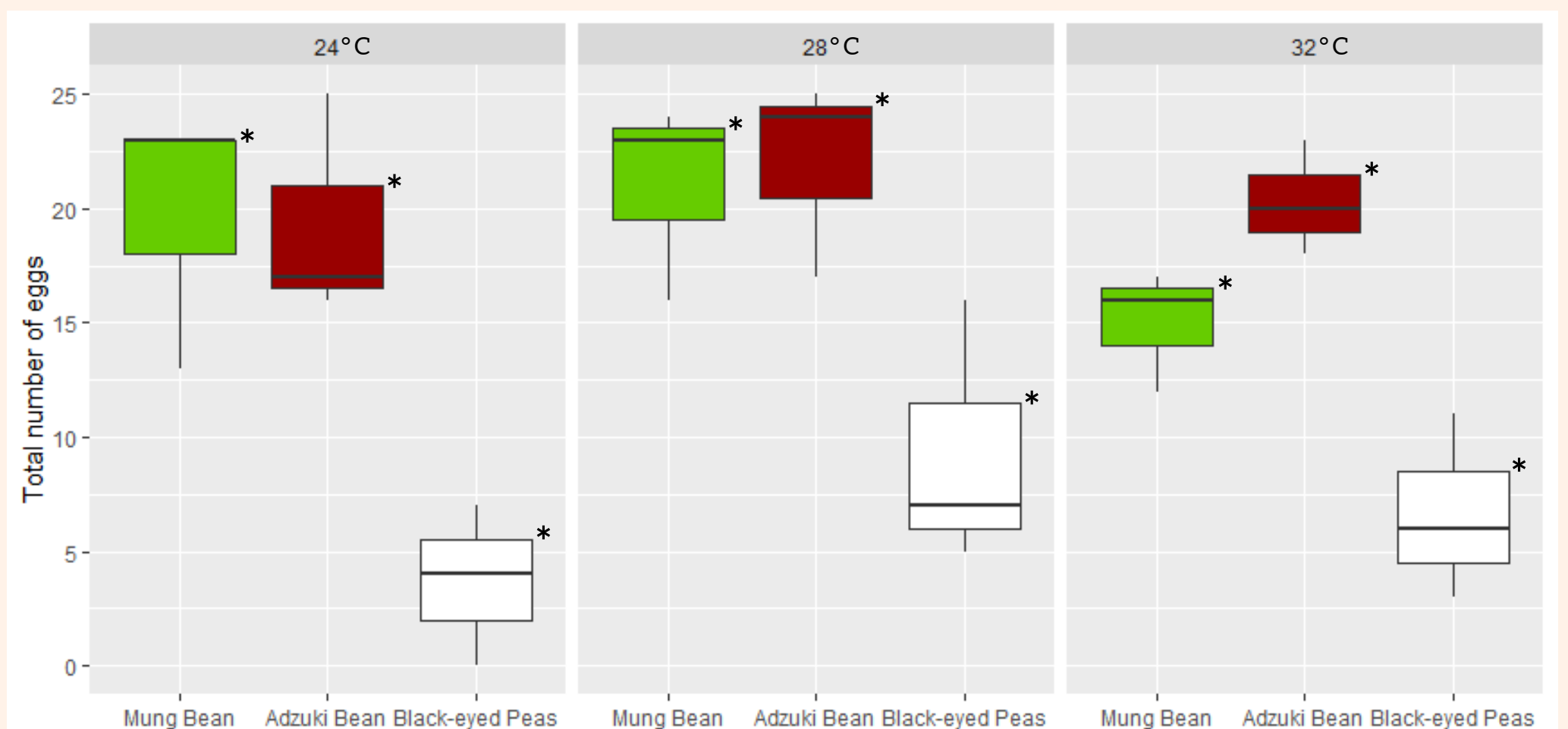


Fig. 4. Boxplot of the total number of eggs for each bean type in 24 °C, 28 °C and 32 °C (asterisks point out the significant results). At 24 °C mung beans is the most prevalent with the highest number of eggs. At both 28 °C and 34 °C the adzuki beans had the most eggs. Black-eyed peas consistently have the fewest eggs at every temperature. The data is only from test dishes, controls are left out.

CONCLUSION & DISCUSSION

Our results show a trend toward an **optimal temperature of 28°C** (fig.3). Our results also show that bean beetles **do have a preferred bean** (fig.4).

However, our results were **not completely in agreement with our hypothesis**, since the beetles do not have a preference for the native mung bean at their optimal temperature. Only at the lowest temperature, there is a preference for the mung bean.

Mixed preferences between adzuki and mung beans, could be due to the higher biomass of adzuki beans compared with the smaller mung bean.

We had periods of time when some beetles were dead. This could have influenced the number of eggs. If we had more variation in temperatures, we could maybe see more pronounced results. This research can be applied in agriculture as a reference to what temperatures to use when growing beans, to avoid damage by bean beetles.

Future research:

- Painting all bean types the same colour to see if size influences preference.
- Same set-up but with beetles native to other beans to look specifically at the relationship between native bean and bean choice.
- Look at the distribution of eggs (multiple on one bean, or one on each).

References

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