



Objectives/Hypothesis

Infestation by insects causes great loss and damage to food products at different stages of cultivation and storage worldwide (Boxall et al. 2002). Insects not only reduce the quantity of stored food crops, but also affects the nutritive value, viability and market-ability of such crops (Oboh et al., 2017). *Callosobruchus maculatus* is one such pest of stored beans. Our purpose was to test the repellent qualities of three essential oils (tea tree, orange, and cinnamon) against *C. maculatus*. EOs represent a potential safe, and natural alternatives to pesticides that can be unaffordable in economically disadvantaged regions, or cause negative impacts to the environment.

Materials

- Scotch Pine Needle essential oil (5% solution)
- Cinnamon essential oil (5% solution)
- Orange essential oil (5% solution)
- Spruce essential oil (5% solution)
- 8 small choice-chambers
- Filter paper
- 1 mL transfer pipettes
- Acetone
- Tape and marker
- 40 male and 40 female bean beetles

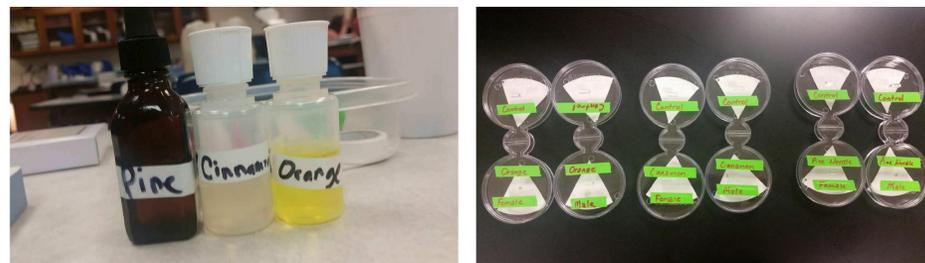
Methods

- Essential oils were diluted using acetone resulting in a 5% essential oil solution.
- We cut Whatman filter paper to fit into each side of each of (8) choice chambers.
- One drop of essential oil solution was added to the filter paper for one chamber and a new pipette was used to add one drop of acetone to a second filter paper for the opposite side as a control. Two choice chambers were prepared for each kind of essential oil.

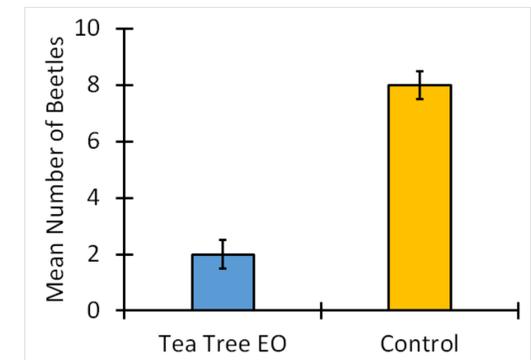
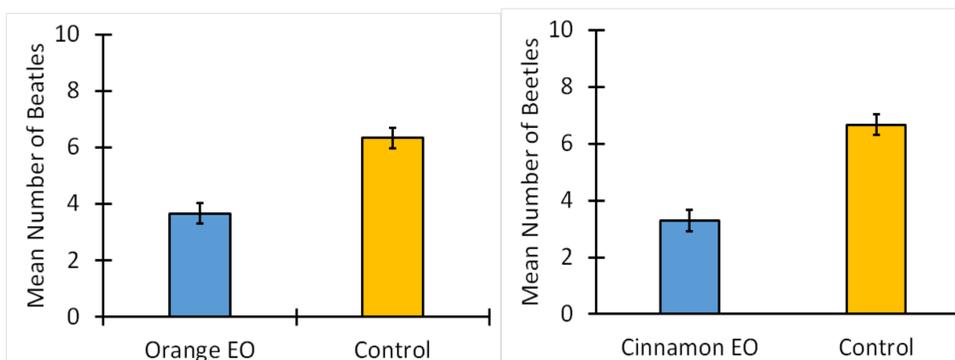
Methods (cont.)

- We separated 40 male and 40 female *C. maculatus* beetles into separate, clean containers using a soft sorting brush.
- After filter paper was allowed to air-dry on a sterile lab-top bench it was placed in corresponding chamber. Then, 10 males were placed into the center of a choice chamber for each essential oil group, and 10 females into a separate choice chamber for each group. Beetles were allowed to move freely undisturbed. After 20 minutes, we counted the beetles on each side of the choice chamber. We recorded results on a prepared table.

Observations



Results



Paired t-test

5% EO vs. Control	t	df	p-value	Mean difference
5% Orange EO	-3.78	17	0.0015	-2.6667
5% Cinnamon EO	-4.71	23	<.000	-3.375
5% Tea Tree EO	-6.07	9	0.0002	-6.0

Conclusions

Each of the 5% essential oils solutions tested (orange, tea tree, and cinnamon) influenced beetle movement away from each inoculated chamber. Paired t-test results indicated the mean difference between the number of beetles in each chamber was significantly different from zero. This provides strong evidence for the repellent effects of each EO on *C. maculatus* compared to our control group and their use as alternatives to synthetic pesticides. Further studies should be conducted in order to determine if their potency is potentiated when combined. Examination of the effect of different concentrations of essential oil solutions should also be pursued.

Works Cited

Oboh, G., Ademosun, A. O., Olumuyiwa, T. A., Olasehinde, T. A., Ademiluyi, A. O., & Adeyemo, A. C. (2017). Insecticidal activity of essential oil from orange peels (*Citrus sinensis*) against *Tribolium confusum*, *Callosobruchus maculatus* and *Sitophilus oryzae* and its inhibitory effects on acetylcholinesterase and Na⁺/K⁺-ATPase activities. *Phytoparasitica*, 45(4), 501–508.